



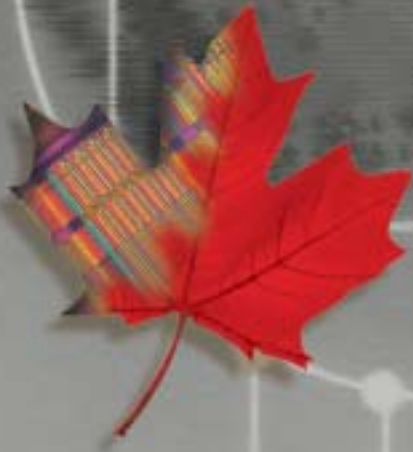
Technology Partnerships  
Canada

An Agency of  
Industry Canada

Partenariat technologique  
Canada

Un organisme  
d'Industrie Canada

INVESTING  
IN OUR  
FUTURE



TPPC

ANNUAL REPORT 2000–2001

Canada

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# Creating Opportunity

In the January 2001 Speech from the Throne, the Government of Canada reaffirmed its commitment for building a world-leading innovative economy that creates opportunity for Canadians in all parts of our land.

An innovative economy is driven by research and development. It requires investments in new technologies as well as a business environment that encourages smart risk-taking and entrepreneurship to develop them.

To stimulate such an environment, the Government of Canada in 1996 established Technology Partnerships Canada (TPC). Since then, TPC has worked closely with its private sector partners to make strategic repayable R&D investments in leading-edge technologies that bring change and encourage growth. Areas targeted for investment include environmental technologies, enabling technologies, and aerospace and defence industries.

TPC's investments have achieved positive results and outcomes. Examples are increased research and development effort in Canada, increased development and use of intellectual property, and high-tech brain gain. Added to these are the high-quality jobs created for Canadians from coast to coast. TPC's investments also bring financial payback for taxpayers, which provides continued funding for additional projects in the future.

TPC practises innovation as well as promoting it. The result is modifications to its business procedures to meet new international trade requirements in response to the changing global research environment. Its upcoming review will help ensure that TPC continues to bring about innovative change through its leadership in strategic investments.

As shown in this Annual Report, Technology Partnerships Canada has been instrumental in creating opportunity for more than five years. Its efforts are helping build an innovative, knowledge-based economy with positive benefits to share for all Canadians.

# Message from the Minister

To prosper in the global knowledge economy, Canada must remain at the forefront of innovation.

That is why the Government of Canada is committed to investing in leading-edge technologies. We want to ensure that Canada continues to be one of the most innovative economies in the world. By supporting pre-competitive and pre-commercialization research and development, we are helping develop technologies that lead to further economic growth.

As Minister of Industry, I am pleased that Technology Partnerships Canada plays an important role in supporting technological development and bringing Canadian products to market more quickly. By making investments with long-term potential, TPC allows the Government to support innovative industries as they are starting out or developing new lines of business. Working with partners in both government and industry, TPC is helping support innovative approaches. These investments leverage funding from other sources — for every dollar invested by TPC, four dollars are invested by others.

These activities are bringing about increased private sector investment in research and development, not to mention the thousands of

highly skilled jobs for Canadians that are being directly created by these projects. By promoting Canada as the leading place for technological innovation, TPC's investments help establish the job climate needed to attract and maintain highly qualified people. In turn, their synergies make possible the exchange of creative ideas that leads to further research and innovation.

TPC also understands the key role played by small and medium-sized businesses in Canada. In 2000–2001, nearly half of TPC funding and two thirds of approved projects were directed to small and medium-sized enterprises — the engine of growth for our economy.

In this Annual Report, you will see how these investments are making a real difference in helping build an innovative Canada that holds the promise of social and economic benefits for all.



Allan Rock, P.C., M.P.  
Minister of Industry

# Message from the Executive Director

Making our country more productive and competitive through innovation is a driving force for the Government of Canada. TPC is one of the key instruments for developing our knowledge economy. It works with businesses to create wealth, jobs and opportunities for Canadians.

This Annual Report shows the evidence of these significant achievements, especially in the fiscal year under review, 2000–2001. This Annual Report also marks a notable milestone — TPC's fifth anniversary. Over these years, TPC has made an impressive array of investments in three key areas of our economy: environmental technologies, enabling technologies, and aerospace and defence industries. By putting resources and collaboration together, TPC has been a catalyst to develop and to commercialize innovative technologies.

Now, after five years, a number of our initial investments are completing their work phase. They are moving into the time when revenues are starting to generate returns both for the company and for the Canadian taxpayer. These funds will enable TPC to increase our investment base and help leverage even more research and development spending.

In this document, you can learn more about TPC's investments with its private sector partners. You will see the wide range of technologies supported by TPC that really are improving the quality of life and standard of living for Canadians. These are fascinating stories — stories of entrepreneurship and innovation.

Above all, this Annual Report clearly shows how TPC is well positioned to directly address government priorities for building a Canada that will continue to be a world leader in the new economy. TPC continues to be flexible in order to adapt to changes in the world investment climate. Through our review, we are ensuring that TPC continues to be both innovative and relevant. I am sure you will agree with me that Canadian taxpayers are well and ably served.

In closing, I would like to thank all the members of the TPC team for their outstanding efforts in achieving these successes. Well done!



Jeff Parker, Executive Director  
Technology Partnerships Canada

# Highlights: Adding It Up

## This year's totals

Fiscal year 2000–2001 saw the following achievements for Technology Partnerships Canada:

- TPC approved \$499 million in repayable R&D investment sharing for 28 Canadian research and development projects.
- These investments leveraged additional commitments worth \$2.7 billion in innovation spending by TPC's private sector partners.
- More than 9 300 high-quality jobs are forecast to be created or maintained during the life of the investments.
- Small and medium-sized enterprises (SMEs) accounted for more than two thirds of TPC projects approved this year. They received 44 percent of total TPC funding.

## Totals since inception

### Forecast

As of March 31, 2001:

- TPC approved a total of about \$1.6 billion in repayable R&D investment sharing for 144 projects.
- As a direct result of TPC's partnering, additional investment commitments worth \$7.4 billion are forecasted to be leveraged from the private sector. This represents approximately \$4.58 for every TPC dollar invested.
- These projects, if successful, are forecast to create or maintain more than 30 000 jobs during the life of the investments.

Actual

***Small and medium-sized enterprises***

- SMEs have received repayable R&D investment sharing worth more than \$558 million.
- Their share of total TPC funding amounts to 33 percent.
- Research and development projects initiated by SMEs number 268, and account for 83 percent of all TPC projects.
- This includes the National Research Council of Canada's Industrial Research Assistance Program (IRAP) which, in partnership with TPC, has approved 189 projects for a total investment of over \$71.5 million.

***Jobs***

- Jobs created or maintained as a result of TPC investments are located across Canada.
- The cumulative distribution is 2 percent in Atlantic Canada, 44 percent in Québec, 42 percent in Ontario and 12 percent in western Canada.

***Leveraged investment***

- As of March 31, 2001, partner companies report that \$2.5 billion in innovation spending has been leveraged. This represents over 80 percent of \$3.1 billion originally forecasted for this time period.

***Repayments***

- Total repayments to date amount to \$20.1 million (royalties \$6.7 million, warrants \$9.3 million, recoveries \$4.1 million). This is approximately 40 percent of the original estimate of \$52.2 million as of March 31, 2001. This is due mainly to longer-than-expected work phases, so royalties are expected to occur slightly later than originally forecast.
- It is important to note that TPC makes long-term investments. On average, the R&D phase of the projects takes 3 to 5 years before completion, while the repayment period can extend from 5 to 20 years. Given the fact that the program is only 5 years old, most investments have not reached the benefits phase, and those that have are still in their formative years of commercialization. This reinforces the need for "patient capital" while these projects mature.



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# A Solid Portfolio

Innovation is a high-risk venture that promises high rewards when successful. To encourage innovation, Technology Partnerships Canada participates with industries based in Canada to invest in projects that otherwise would not proceed within the desired scope, timing or location.

Technology Partnerships Canada targets investment in high-tech research conducted in three key industry sectors:

- environmental technologies
- enabling technologies (advanced manufacturing and processing technologies, advanced materials processes and applications, biotechnology, and information and communications technologies)
- aerospace and defence industries.

The following activities are eligible for TPC-shared funding:

- industrial research
- pre-competitive development
- studies.

TPC targets these sectors and activities because of their strategic influence on other industries. Innovation in these three sectors maintains and grows the nation's technology base while augmenting technological capabilities throughout Canadian industry. As a result, social as well as economic objectives are attained, including creation of jobs and wealth along with sustainable industrial expansion.

The recent WTO challenge resulted in many aerospace and defence projects being put on hold over the last two years. This created a significant pent-up demand for investments at the start of the year. As a result, in 2000 – 2001, TPC investments were directed mainly (85 percent of total value) to aerospace and defence industries. At the same time, this sector received more than half (60 percent of total number) of approved projects. The previously delayed aerospace and defence approvals allowed the program to increase the weighing of environmental and enabling approvals during each of the two previous years. The distribution of investments in the TPC portfolio now is close to the long-range target of two thirds in aerospace and defence industries and one third in environmental and enabling technologies.

TPC is committed to the development of small and medium-sized enterprises (SMEs) in all regions of Canada. In 2000–2001, nearly half of TPC repayable R&D investment funding and more than two thirds of project approvals were extended to SMEs. Consequently, TPC's outreach to SMEs now constitutes close to one third of total portfolio value.



## Performance Review



# Performance Review

As of March 31, 2001, TPC's portfolio consisted of 132 active investments totalling \$1.6 billion, which will leverage investment commitments of \$7.4 billion (approximately \$4.58 for every TPC dollar invested). These projects, if successful, are forecast to create or maintain more than 30 000 jobs for the life of the projects.

TPC projects are undertaken in two phases. The work phase represents the period over which contributions toward eligible costs are provided. The benefits phase is the period during which the resulting technology is inserted into the company's products or processes and economic benefits (including repayment) of the project are realized. The work phase typically lasts between two and five years, while the benefits phase may vary anywhere between five and 20 years. After five years of operation, 36 projects now have successfully completed the work phase and have commenced the benefits phase.

In measuring its performance, TPC focusses on three core areas: jobs, leveraged investment, and sharing of risk and rewards including repayments.

## Jobs

As of March 31, 2001, partner companies report that over 5 600 jobs have been created or maintained. This means that TPC has achieved 92 percent of the target of 6 100 jobs for the same period.

In order to improve consistency and make the job figures more reliable on a year-to-year basis, TPC has modified the methodology used to calculate jobs created or maintained in each year. The new method more accurately converts person-years into job numbers, while taking into account the project length.

TPC's investments in innovative technologies and the large number of highly skilled Canadian jobs these technologies create or maintain have a significant impact on our economic growth. All companies being considered for TPC investment must provide a schedule of jobs forecast to be created or maintained, an annual report of their job achievements and updated forecasts.

TPC counts two types of jobs that are created or maintained by its projects:

- jobs directly involved in the work phase of a project
- jobs directly involved in the subsequent benefits phase

TPC's job estimates are conservative, since only jobs directly generated by its project commitments are included. TPC's job count totals exclude the following:

- jobs not directly involved in the project but created or maintained concurrently in other areas of a company
- jobs generated indirectly through TPC-supported projects such as the number of jobs created or maintained by suppliers, producers of ancillary products or purchasers of end products



*SemBioSys Genetics Inc.*

## Leveraged Investment

As of March 31, 2001, partner companies report that \$2.5 billion in innovation spending has been leveraged. This represents over 80 percent of the original forecast amount of \$3.1 billion.

TPC investments leverage private sector spending in both research and development and commercialization, which are key to stimulating economic growth. Industry generally finances its share of this spending through a variety of sources, including:

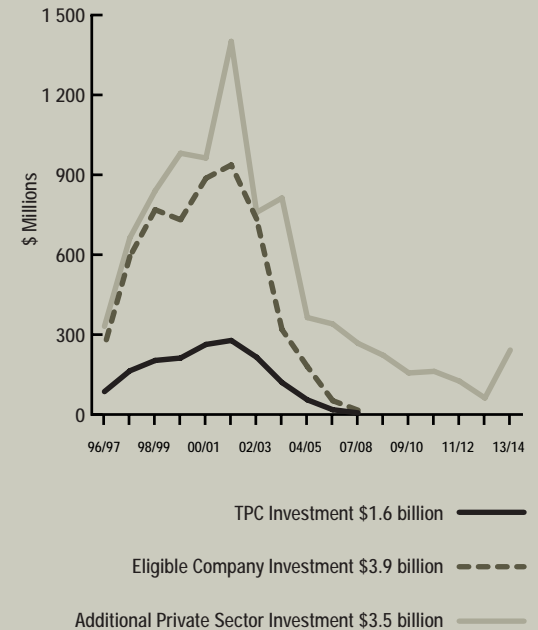
- internally generated cash flow from operations
- debt and equity financing
- generally available tax incentives, such as the federal government's Scientific Research and Experimental Development tax credits
- other federal and provincial assistance programs

Forecast project investment can be divided into three parts:

- TPC's investment
- the company's share of eligible development costs
- additional non-supported development costs such as the cost of land and buildings to conduct research and development, and follow-on investment such as the cost of establishing manufacturing facilities in Canada

Occasionally, investment leverage can include project costs incurred outside Canada that are deemed essential to the successful completion of a project. These costs relate to activities that, for practical reasons, cannot normally be carried out in Canada. Examples of such costs include the use of specialized test facilities or clinical trials by biopharmaceutical companies, where Canada lacks the right mix of patients with the targeted disease or diseases.

## Projected Investment Leverage on 132 Projects, Contracted as of March 31, 2001 (Excluding IRAP-TPC)



### ***Risk and Reward Sharing***

TPC has received \$20.1 million in royalty repayments, warrants and recoveries. Mandated to make high-risk investments, TPC administers an investment fund that shares both risk and rewards with its private sector partners. However, unlike commercial financial institutions that measure return solely in financial terms, the return to TPC also takes account of a broad range of non-financial benefits to Canada that flow from successful projects. These benefits may include:

- economic growth and job creation
- contributions to sustainable development
- development of capable and competitive SMEs in all regions
- growth in private sector investment spending
- maintenance and growth of the industrial technology and skill base essential for innovative products and services.

This balancing of financial and public policy objectives distinguishes TPC from commercial financial institutions.

TPC determines an appropriate balance of investment risk and repayment terms that will enable its private sector partners to proceed with an approved project. Sharing ratios (the ratio of TPC investment to total supported development costs) vary from project to project; they have ranged from 20 to 50 percent. As of March 31, 2001, the weighted average sharing ratio of the portfolio was 29.4 percent. When negotiating an appropriate sharing of investment risk, TPC takes into account other government funding (both federal and provincial) that may be available to support a project.

TPC's approach to risk and reward sharing is based on the anticipated return on successful projects, and takes into account the level of risk, the expected benefits to Canadians and the level of return received by the company. At the same time, because many projects embody considerable technical and commercial risk, not all projects will be successful. However, the number of projects that do not succeed is less than 1 percent. TPC shares in the returns should projects fare better than forecast. All TPC repayments are reinvested to help grow the fund.

Since its inception in the spring of 1996, TPC has approved investments worth \$1.6 billion in 144 projects. Of these, five projects were voluntarily withdrawn before any funds were disbursed. Only five smaller investments have been unsuccessful, with little or no expectation of repayment to TPC. These represent 3.5 percent of the total number of projects in our portfolio and 0.3 percent of funds disbursed. Furthermore, TPC has negotiated termination agreements with two other companies for a settlement of \$4.06 million, which represents an internal rate of return of over 26 percent to TPC on these investments. This leaves 132 active projects in TPC's portfolio as of March 31, 2001.

### **Summary**

In view of the risks inherent in high technology projects, TPC recognizes that not all projects will succeed and, consequently, not all contributions will be fully repaid. The results to date demonstrate that TPC has achieved significant progress in fulfilling its mandate and long-term expected benefits in the areas of job creation, investment leveraging and return on investment. TPC remains committed to future investment performance that will continue to create job and wealth opportunities nation-wide for Canadians.

## TPC Portfolio Distribution

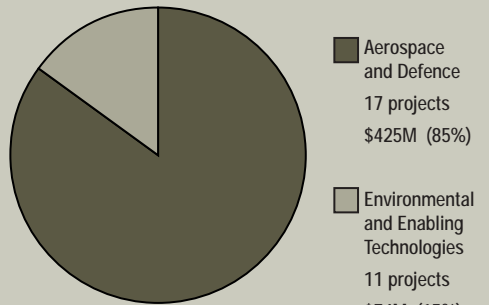
### ***Distribution by Technology***

Over the long term, TPC targets one third of TPC funding to environmental and enabling technologies. Environmental and enabling technologies represent about 36 percent of investments as of March 31, 2001. In 2000–2001, 85 percent of approved investments were in aerospace and defence (A&D) technologies, and 15 percent were in environmental and enabling (E&E) technologies.

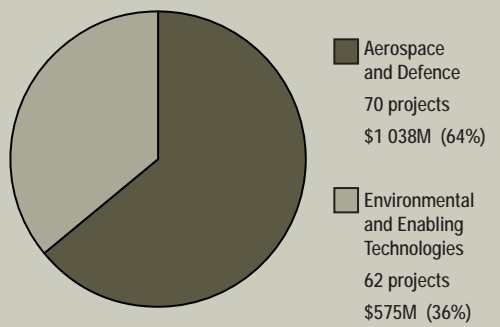
Annual approvals will vary, depending on demand, the carry-forward of previously unused budget allocations and the reallocation of recoveries or repayments.

## **Distribution of Investments, by Technology (Excluding IRAP-TPC)**

### **2000–2001 Distribution**



### **Cumulative Distribution as of March 31, 2001**



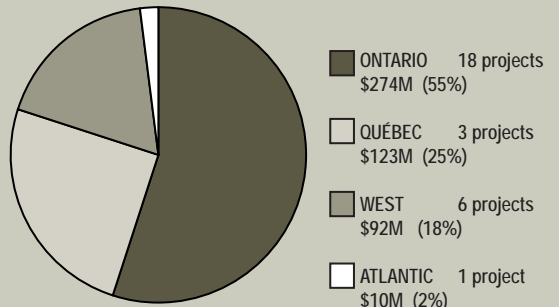


### Distribution of Investments by Region and Firm Size

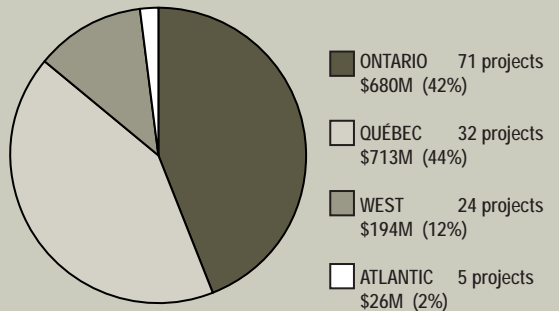
TPC repayable R&D investments are available to various sizes of firms in every region of Canada, and 2000–2001 investments supported projects in all regions. The majority of companies developing new, knowledge-based technologies are located in Ontario and Québec, and TPC’s project funding numbers reflect these location concentrations. As of March 31, 2001, small and medium-sized enterprises (SMEs) composed 30 percent of total TPC investments. In addition, IRAP–TPC focusses on small SME investments.

### Distribution of Investments, by Region (Excluding IRAP–TPC)

#### 2000–2001 Distribution

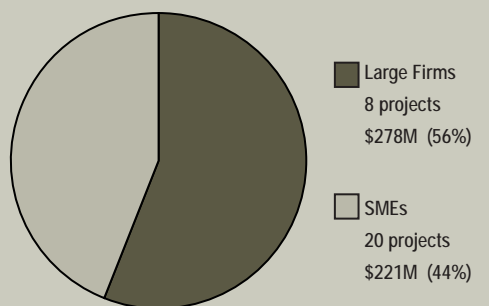


#### Cumulative Distribution as of March 31, 2001

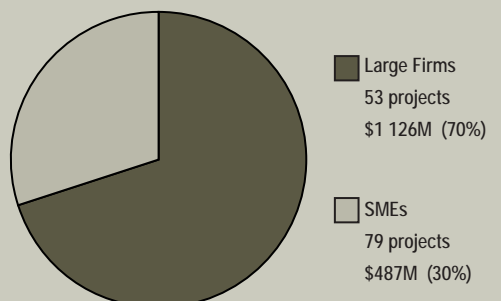


### Distribution of Investments, by Size of Firm (Excluding IRAP–TPC)

#### 2000–2001 Distribution



#### Cumulative Distribution as of March 31, 2001



## IRAP-TPC

Technology Partnerships Canada provides repayable R&D investments to SMEs both directly and through its partnership with the National Research Council of Canada's Industrial Research Assistance Program (IRAP-TPC). IRAP-TPC was established in 1998-1999 to make pre-commercialization assistance more readily available to SMEs across Canada. The IRAP-TPC program is cost-shared on a 50:50 basis between IRAP and TPC, and has a budget of \$30 million per year. IRAP-TPC is mandated to:

- provide investment to SMEs (fewer than 500 employees) with project costs under \$1.5 million
- stimulate technology development by providing support for pre-commercial innovation projects
- serve as a source of information, direct technical assistance to the latest technological advances, facilities and other resources, and provide access to expertise in the business end of innovation.

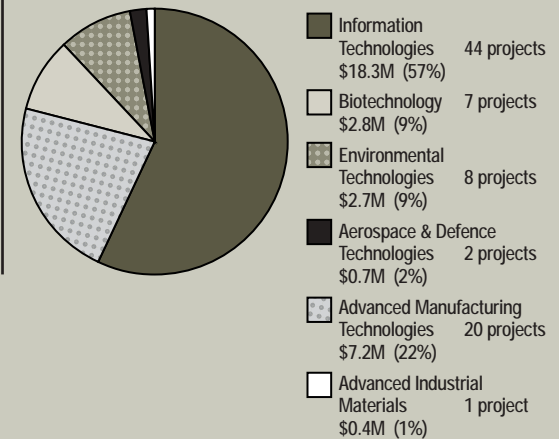
By adding IRAP-TPC to the existing IRAP structure, the National Research Council is able to deliver IRAP-TPC through a network of over 260 Industrial Technology Advisors in seven IRAP regions across Canada and 145 partner organizations in 90 communities. IRAP's advisors provide direct liaison with clients and consider regional concerns, priorities and resources.

### IRAP-TPC Summary of 2000-2001 Investments

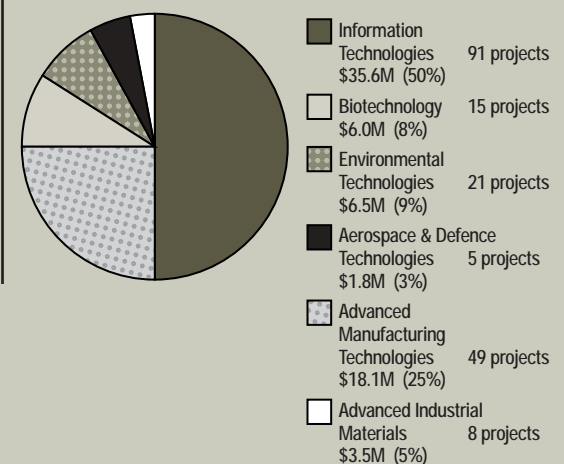
In its third year of operation, IRAP-TPC has continued its efforts to reach full-scale delivery of the program. As a result of IRAP's wide distribution network, IRAP-TPC was able to approve 82 SME projects (\$32.1 million of investment) during 2000-2001. As of March 31, 2001, the IRAP-TPC portfolio consisted of 189 projects (total investment of over \$71.5 million), with an average contribution of approximately \$378 000. These projects span all targeted sectors across Canada, with the Atlantic and western Canada regions acquiring almost 48 percent of cumulative funding.

## IRAP-TPC Investments, by Technology

### 2000-2001 Distribution

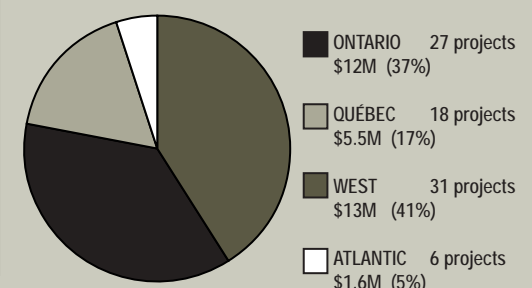


### Cumulative Distribution as of March 31, 2001

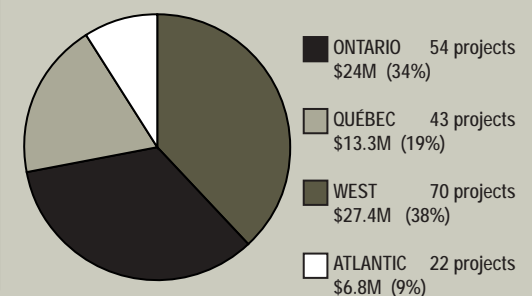


## IRAP-TPC Investments, by Region

### 2000-2001 Distribution



### Cumulative Distribution as of March 31, 2001





# Strategic Investments in 2000–2001

Environmental Technologies

Enabling Technologies

Aerospace and Defence

# Environmental Technologies

Technology Partnerships Canada recognizes that the benefits to be gained from the development of environmental technologies are wide ranging and far reaching. In today's world, there is an increasing emphasis on sustainable development, along with a corresponding need by businesses and industries for pollution prevention and cleaner production processes.

TPC's strategic investments in this area are supporting the development of innovative technologies that:

- contribute to the achievement of sustainable development
- offer cost efficiencies over traditional methods
- promise tangible environmental benefits to Canada.

Technology Partnerships Canada targets investments that address the government's environmental priorities of climate change, sustainable development, pollution prevention and clean water. Pollution abatement and remediation technologies are also an investment focus.

TPC's approach includes investing in eco-efficient technologies that offer environmental benefits while contributing to economic growth, productivity and job creation as well as supporting energy efficiency and the development of renewable and alternative sources of energy.

In all, TPC works closely with its partners, both in the private sector and government. Three of this year's investments in environmental technologies include funding with the Technology Early Action Measures (TEAM) component of the federal government's Climate Change Action Fund (CCAF).

## FuelMaker Corporation

Reducing consumer dependence on gasoline-powered vehicles and thus reducing air pollution caused by their emissions is the goal of FuelMaker Corporation with its Home Refuelling Appliance (HRA). The machine compresses and dries natural gas from a residential natural gas supply, allowing commuters to refuel their natural gas-powered vehicles both safely and conveniently at home overnight. The challenges for the Toronto-based company are to double the HRA's current expected service life and to make it more affordable. The intended result is an increase in the popular appeal of vehicles powered by cleaner-burning alternative fuels.

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**CCAF-TPC approved repayable R&D investment: \$2.96 million**

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## GFI Control Systems, Inc.

Vehicles capable of switching between gasoline and cleaner-burning alternative fuels can significantly reduce greenhouse gas emissions and other pollutants from exhaust. GFI Control Systems, Inc. is developing a bi-fuel system at Kitchener, Ontario, that integrates advanced fuel injection control with original equipment engine controllers in small passenger and utility vehicles. Research and development work on eliminating the need for a second computer and maintaining engine performance under temperature and fuel quality variations will lower vehicle operating costs while protecting the environment.

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**CCAF-TPC approved repayable R&D investment: \$6.5 million**

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*FuelMaker Corporation*

## LPP Manufacturing Inc.

Incorporating superior design technologies into single- and twin-cylinder gasoline engines will allow LPP Manufacturing Inc. to develop products that help reduce smog as well as meet Kyoto Protocol targets for curtailing greenhouse gas emissions by the year 2010. Small gasoline engines currently have minimal emission controls and represent a substantial source of off-road air pollution. TPC's repayable R&D investment in the Guelph, Ontario-based company will help expand its in-house technological expertise in the design, building and assembly of gasoline engines in the 4–18 kW (5–24 horsepower) power range. It will also help establish LPP as a centre of innovation in research and development capabilities in the small engine sector.

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CCAF–TPC approved repayable R&D investment: \$9.28 million

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## ZENON Environmental Inc.

Improved membrane filtration technology will hasten replacement of older water treatment methods to make Canada's municipal water supply safer and freer from microbial pathogens and chlorine-resistant parasites. ZENON Environmental Inc. is developing and testing its state-of-the-art membrane filtration systems at its facilities in Oakville and Burlington, Ontario. The technology improvements hold promise for reduced energy use, lower operating costs, simpler operation and smaller size compared with conventional filtration. The innovations would also augment Canada's reputation in providing high-quality environmental technologies.

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TPC approved repayable R&D investment: \$9.89 million

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*ZENON Environmental Inc.*



# Enabling Technologies

With their potential to significantly improve performance and productivity for a wide range of Canadian industries, enabling technologies are essential to economic growth. Their social benefits include the power of biopharmaceuticals in the prevention and treatment of some of society's most devastating diseases and the use of information and communications technologies to connect Canadians as well as advance educational and electronic commerce applications.

Technology Partnerships Canada provides strategic investments for:

- advanced manufacturing and processing technologies
- advanced materials processes and applications
- biotechnology
- information and communications technologies.

Advanced manufacturing and processing technologies are key to creating manufacturing improvements that increase productivity and decrease resource use. TPC encourages development of advanced manufacturing technologies that can impact on the competitiveness of an industry sector or geographic cluster of firms.

Advanced materials technologies impact across many industrial sectors. Their use in growth industries such as aerospace and electronics is essential to driving the development of new products and markets. TPC focusses on areas where there are existing Canadian strengths. Examples are metal powders, high purity metals, ceramics specialties, polymer specialties and composite materials.

TPC's biotechnology strategy is focussed on ensuring that our biotechnology firms move up the research and development value chain. TPC helps small and medium-sized businesses grow, and it supports established Canadian companies in developing fully integrated capabilities.

Broadband access to the Internet, both wired and wireless, is a primary focus for TPC investments in information and communications technologies, as well as core technology development in areas such as photonics, microelectronics, and e-commerce applications and software development.

### Bioniche Life Sciences Inc.

Biotechnologies that allow researchers to better understand cell wall structure in both humans and animals hold promise for new therapies in treating bladder and prostate cancers in men and in aiding cattle production. Bioniche Life Sciences Inc. is developing procedures for extracting cell wall components from pure strains of micro-organisms at its laboratories in Ontario, Québec and Alberta. Commercial batches of formulations from the extracts will enable cancer researchers as well as veterinarians to improve treatments, reduce treatment costs and enhance Canada's international reputation and presence in health research.

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**TPC approved repayable R&D investment: \$9.6 million**

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### Bioniche Life Sciences Inc.

Vaccines to immunize cattle, swine and horses against disease-causing bacteria that can be transmitted to humans in food or water could prevent poisoning outbreaks and improve Canadian public health. Bioniche Life Sciences Inc. is developing antigens that stimulate a strong immune response in the intestinal walls of animals to eliminate specific bacteria from their digestive tracts. The company's Belleville, Ontario, facility will become the first Canadian manufacturer of animal health vaccine products and will replace a large percentage of imported vaccines.

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**TPC approved repayable R&D investment: \$7.6 million**

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### Intelligent Mechatronic Systems Inc.

"Smart" automotive crash sensors could save more lives and reduce injuries by varying their response on impact to specific occupant needs. Intelligent Mechatronic Systems Inc. of Waterloo, Ontario, is seeking computer software solutions capable of making calculations and launching responses within fractions of a second. The systems would then adapt restraint devices, such as airbags, according to the precise size, weight and position of each occupant as well as the velocity, direction of impact and other significant vehicle information. The computer logic solutions, which have the ability to learn from their environment, may also enable similar integration of technologies in mining, aviation, medicine and telecommunications.

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**TPC approved repayable R&D investment: \$3 million**

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*Intelligent Mechatronic Systems Inc.*





### Intellivax International Inc.

New vaccines that fight microbial infections as they enter the body through mucous membranes may be faster acting and offer more complete protection from illnesses. Montréal-based Intellivax International Inc. is developing its patented delivery technology by combining vaccines with protein membrane spheres so the vaccines can be delivered orally or nasally instead of by injection. The vaccines will stimulate antibody production against invading pathogens both at the entry site and in the bloodstream. They could be administered by patients themselves or by less-trained health care workers. The benefit would be cheaper and more widespread vaccination of the general public, which could help enhance Canada's capacity to respond to pandemic influenza crises.

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**TPC approved repayable R&D investment: \$5.94 million**

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### SemBioSys Genetics Inc.

Purified proteins for cosmetic or pharmaceutical applications are costly and difficult to produce. Biotechnologies for extracting specific proteins from oil bodies grown in genetically modified oilseed crops, now being developed by SemBioSys Genetics Inc. of Calgary, Alberta, could dramatically reduce purification costs. The challenge is to adapt laboratory production to commercial scale. Harvesting proteins from molecular farming of oilseed crops could enable production of a broader range of human proteins than are currently grown from micro-organisms and fungi. The success of this project can also give farmers an opportunity to diversify production into more profitable specialty crops.

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**TPC approved repayable R&D investment: \$5.52 million**

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*Bioniche Life Sciences Inc.*

## Sierra Wireless Inc.

Laptop computers may soon allow Canadians to tele-work from anywhere and at high speed with their home offices. Sierra Wireless Inc. of Richmond, British Columbia, is developing modems capable of sending large volumes of data over the Internet without wired hookup. The technology will allow electronic commerce to become more mobile. The research and innovation processes for developing the technologies will also help establish a core information technology cluster in British Columbia's Lower Mainland region that can enable other industries and processes to grow.

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**TPC approved repayable R&D investment: \$10 million**

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## Vortek Industries Limited

The demand for faster, more powerful computing continues to change existing semiconductor manufacturing processes. Vortek's Rapid Thermal Processing (RTP) product is an innovative answer to an emerging unfilled manufacturing requirement. The result could be a breakthrough in miniaturization and cost reductions in semiconductor manufacturing. Vortek Industries Limited of Vancouver, British Columbia, uses a single, very high-powered arc lamp to rapidly anneal the semiconductor and produce higher-quality integrated circuits. The smaller, faster chips can enable advanced manufacturing and processing technologies in many industrial sectors. TPC's repayable R&D investment can also increase interactions between universities and colleges in British Columbia and the high technology sector.

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**TPC approved repayable R&D investment: \$3.85 million**

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*Vortek Industries Limited*



# Aerospace and Defence

Canada's aerospace industry is a major contributor to our country's economic and social well-being. As well, it plays a vital role in making Canada one of the most innovative economies in the world.

A critical incubator of advanced technologies that find applications in almost every other sector of Canada's economy, the aerospace industry is responsible for 15 percent of our manufacturing research and development activities. In addition, it employs more than 95 000 Canadians in high-quality, high-paying jobs. Canadian aerospace capability spans the complete spectrum of products and services, from complete aircraft and complex integrated systems to specialized processes and services.

The Aerospace and Defence component of Technology Partnerships Canada encourages and supports the development and application of technologies essential for the strengthening of these sectors. The Aerospace and Defence sectors' activities involve projects that sustain and expand their technological capacity and capability.

TPC investments in aerospace and defence industries focus on:

- advanced avionics and electronics
- aircraft engines and engine components
- aircraft structures, components, systems and materials
- simulation and modelling
- space systems and components, including communications systems.

Technology Partnerships Canada also invests in defence conversion projects aimed at reducing dependency on military contracts.

# Initiatives for Small and Medium-sized Enterprises

During 2000–2001, TPC took action and developed two initiatives aimed at helping small and medium-sized Canadian aerospace and defence firms better meet the challenges of the global economy.

The TPC Aerospace and Defence Supplier Development Initiative is a \$30-million, three-year pilot program to help SMEs in the aerospace and defence sector develop and incorporate world-class business and manufacturing technologies.

The Canadian Aerospace Collaborative Technology Development Program is a \$9-million, three-year pilot program to encourage early-stage research and development collaboration.

The challenge posed by globalization for Canadian SMEs was highlighted in a PricewaterhouseCoopers study on Canada's aerospace sector that was jointly funded by Industry Canada and the Aerospace Industries Association of Canada (AIAC). The study concluded that many of Canada's aerospace SMEs have yet to fully adapt to structural changes taking place in their industry. These changes are the result of the devolution of larger aircraft manufacturers to fewer suppliers who can provide the exacting specifications for the design and development of complete aircraft components.

The Supplier Development Initiative will assist the SMEs in strengthening their manufacturing and management systems to keep pace with the demands of a changing industry.

The Collaborative Technology Development Program will help address research and development priorities identified through Industry Canada's Technology Road Map process. The emphasis on a collaborative approach is aimed at ensuring that the new technologies can diffuse rapidly throughout the Canadian aerospace and defence sector. This program is being undertaken in partnership between TPC and the AIAC–National Research Council (NRC) Office of Collaborative Technology Development.

### CAE Inc.

Airplane pilot training in the high-growth regional and business jet aircraft sector could become more affordable and more accessible with the adaptation of flight simulation programs for personal computers. CAE Inc. of Saint-Laurent, Québec, is simplifying the operating systems for its training systems and is making them available over the Internet for distance learning. In addition, it will undertake an R&D program related to advanced flight simulation technologies aimed at achieving the simplification and cost reduction that would enable full flight simulators to be cost-effective for use by pilots of regional and business jet aircraft. The repayable TPC investment will also help enlarge the core of Canada's technological capability in this subsector.

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**TPC approved repayable R&D investment: \$41.4 million**

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### Cascade Data Services Inc.

Linking several low earth orbit satellites into one integrated communication system may overcome current capacity limitations for sending extremely large packages of data files over the Internet. Two satellite missions led by Cascade Data Services Inc., based in Richmond, British Columbia, will test the network concept and then demonstrate commercial applications. The space network could extend the availability of complex medical tests requiring large graphic files using medical scanning devices to patients in rural Canada. It could also permit enhanced connectedness for business and government with increased security for transmitting sensitive information from remote locations.

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**TPC approved repayable R&D investment: \$87.07 million**

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### Casebank Technologies Inc.

Rapidly expanding air traffic and increased consumer concern over flight safety are creating a global shortage of qualified aircraft technicians. To address the need, Casebank Technologies Inc. of Brampton, Ontario, will design a knowledge-based management system for technicians anywhere in the world to locate maintenance solutions for any type of aircraft. The company will also develop case-based reasoning software for on-board installation to detect elusive aircraft faults. A datamining program



*Honeywell ASCA Inc.*

will assemble interactive electronic technical diagnoses from actual aircraft repair records. The benefits would be faster and cheaper diagnostics as well as increased airline safety.

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**TPC approved repayable R&D investment: \$3.23 million**

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#### Coltec Aerospace Canada Ltd.

Advanced technology transport aircraft require integrated, landing gear systems. Coltec Aerospace Canada Ltd. at its Oakville, Ontario, facilities will develop and assemble the technologies needed for the design, testing and manufacture of advanced landing gear and flight control systems for these aircraft. The project will also investigate new advanced materials processing techniques. This initiative will help Coltec create a growth-oriented systems house to provide high-value-added integrated systems solutions on a broad range of landing gear and flight control systems.

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**TPC approved repayable R&D investment: \$45.5 million**

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#### COM DEV Limited

Developing components for communication satellite signal devices to operate at higher frequencies could significantly increase the capacity of the Internet to send and receive data. COM DEV Limited will investigate the properties of materials and the design of surface acoustic wave filters for their ability to convert energy from one form to another acoustically rather than digitally. The goals will be to reduce component size and mass, lower power consumption and simplify their design. The company's Cambridge, Ontario, facility will also upgrade manufacturing processes for high-volume production of the signal devices for both military and commercial applications.

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**TPC approved repayable R&D investment: \$2.47 million**

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*Indal Technologies Inc.*



### Guigné Inc.

The identification of hazards in underwater environments could result from more accurate underwater imaging technology being developed by Guigné Inc. Acoustic imaging technology being developed by the Paradise, Newfoundland-based company will create narrow beams of sound at various frequencies and amplitudes reflect off the seabed and other structures, record the echo and interpret the sound wave patterns. The benefits will be precise, high-definition measurement and detection of submerged hazards. The technologies may be adapted for fishery, commercialization in space and the detection of landmines under water.

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**TPC approved repayable R&D investment: \$4.86 million**

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### Honeywell ASCA Inc.

An initiative of Honeywell ASCA Inc. of Mississauga, Ontario, will undertake a broad sustaining technology development program in aerospace controls, fuel controls, power generation capabilities, sensors and software. Project tasks will include improved integration of components using advanced software and hardware systems. The major benefit expected will be solidifying the competitiveness of Honeywell ASCA Inc. and its suppliers.

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**TPC approved repayable R&D investment: \$46.57 million**

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### iFire Technology Inc.

Overcoming size limitations and high costs of building flat panel computer and video display screens will be the goal of iFire Technology Inc., a research and development corporation based in Toronto, Ontario. Its proprietary technology for solid state flat panel display screens may hold the key for widespread use of larger screen sizes in defence electronics as well as in television applications. The challenge will be to maintain full-motion video capability with high brightness and resolution, long operating life and low cost in larger screen sizes. The initiative will include designing automation techniques for production and verifying external supplier inputs.

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**TPC approved repayable R&D investment: \$30 million**

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*Honeywell ASCA Inc.*

### Indal Technologies Inc.

Safer helicopter flight operations on-board Canadian and allied navy ships may result from wireless aircraft handling technology being developed in Mississauga, Ontario. Indal Technologies Inc. will evaluate and modernize its current systems. Technical challenges will address automation and operational enhancements, advanced computer modelling and avionics systems design. Benefits will include increased accuracy, reliability and precision in sensors, controls and mechanical systems.

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**TPC approved repayable R&D investment: \$2.97 million**

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### MacDonald Dettwiler Space and Advanced Robotics Ltd.

More accurate spacecraft rendezvous and docking systems could increase the range of tasks able to be performed on unmanned space missions for commercial and industrial applications. Research at the Brampton, Ontario, facilities of MacDonald Dettwiler Space and Advanced Robotics Ltd. will develop cameras for artificial vision systems in space. The cameras must be able to tolerate radiation exposure, cold temperatures and low vacuum conditions in space and have a long life span in orbit. They will be integrated with software for locating and recognizing docking points, targets and hazardous areas such as fuel tanks, windows and piping.

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**TPC approved repayable R&D investment: \$3.95 million**

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### Magellan Aerospace Limited

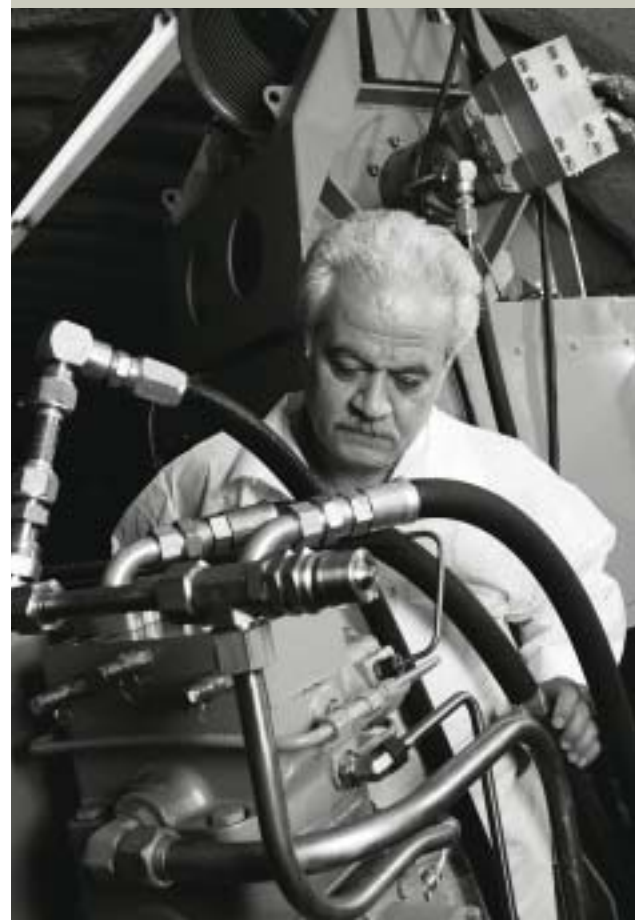
Shrinking numbers of aircraft manufacturers plus the rise in the costs of designing, building and introducing new aircraft has changed the way in which the aerospace industry does business. Magellan Aerospace Limited is focussed on fully developing its systems integration capability so that it will remain a vital element in the industry for years to come. The specific results of this project will enable Magellan to achieve this goal as well as to re-engineer the life cycle costs of major aerospace structures. This TPC-supported initiative will help protect the long-term global competitiveness of Canadian aerospace and defence industries.

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**TPC approved repayable R&D investment: \$8.16 million**

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*Indal Technologies Inc.*





## Messier-Dowty Inc.

Continuing demand for complex integrated landing gear systems presents significant growth opportunities and challenges in the aircraft industry. Messier-Dowty Inc. of Ajax, Ontario, will conduct critical analysis, evaluation and technical bench marking of new software and hardware tools for engineering design and development of landing gear components. The tools will be applied to components design, testing and analysis. The initiative will culminate in the development of enhanced capabilities for processing advanced materials with a high ratio of strength to mass using alloys that improve durability.

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**TPC approved repayable R&D investment: \$24.88 million**

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## Neptec Design Group Ltd.

A critical aspect of international space station assembly will be the development of products able to operate in the harsh sunlight and deep shadows of space. Neptec Design Group Ltd. will build on core technology licensed from the National Research Council of Canada to develop scanning laser sensors for long-range measurement and tracking. The sensors will emit laser beams and detect their reflected signal to produce three-dimensional measurement data, rather than the two-dimensional images of current television camera technology. The laser technology developed at the company's facilities in Kanata, Ontario, will also offer significant weight, volume, performance and cost advantages.

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**TPC approved repayable R&D investment: \$6.15 million**

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*Neptec Design Group Ltd.*

### Norsat International Inc.

Higher-capacity, higher-speed and more cost-effective advanced interactive terminals will be required to meet the level of demand for Internet services to make Canada the most connected nation in the world. Satellites developed by Norsat International Inc. would enable two-way broadband Internet access from a personal computer, eliminating the need for a terrestrial connection. Technology developed at the company's Burnaby, British Columbia, and Winnipeg, Manitoba, facilities would allow Internet communications that may be up to a thousand times faster than a typical telephone modem or ten times faster than a cable modem, without the infrastructure upgrades that the competing technologies require.

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**TPC approved repayable R&D investment: \$9.38 million**

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### Pratt & Whitney Canada Corp.

Cost and pricing issues are replacing technology differentiation in determining the commercial success of small gas turbine engines. To maintain its profile in the Canadian aerospace industry, Pratt & Whitney Canada Corp. will conduct generic technology research and development in its facilities at Longueuil, Québec, and Mississauga, Ontario. One goal is to compress development cycle time from the current 36 months to 30 months and further to 24 months or less. The initiative will integrate and test new engine component technologies in follow-up to basic research work.

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**TPC approved repayable R&D investment: \$99.6 million**

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*Norsat International Inc.*



# Program Administration

Technology Partnerships Canada is committed to limiting its administration costs by using new and innovative delivery mechanisms. To meet this challenge, TPC has developed partnership and service agreements with other areas of Industry Canada and other government departments, rather than developing its own group of experts. These agreements enable TPC to access existing government expertise related to technological assessments, repayment administration, communication, finance, legal, contracting, cost analysis, claim verification and audit.

TPC strives to limit its administration expenses to approximately 3 percent of its total program funding (\$8.5 million or 3 percent of \$285 million for 2000–2001, excluding the \$15 million dedicated to IRAP–TPC). In 2000–2001, TPC spent \$8.3 million in program administration, within its targeted budget.

The IRAP–TPC program is delivered through a localized and highly decentralized network of Industrial Technology Advisors and partner organizations. Regional delivery to SMEs is achieved by advisors in seven IRAP regions across Canada to provide direct liaison with clients in a context that takes into account regional concerns, priorities and resources. As a result, this program incurs higher administration costs as a percentage of program approvals (\$2.2 million or 7.2 percent of \$30 million). In 2000–2001, IRAP–TPC fully expended its budgeted amount of \$2.2 million.

# Statement of Operations (\$000)

(FOR THE YEAR-ENDED MARCH 31, 2001)

TPC	2000-2001	1999-2000
SALARY		
Regular salaries	3 532	3 208
Employee benefits	706	642
<b>TOTAL SALARY</b>	<b>4 238</b>	<b>3 850</b>
NON-SALARY		
Transportation and communications	353	388
Information	690	632
Professional and special services	1 607	2 436
Other	1 386	643
<b>TOTAL NON-SALARY</b>	<b>4 036</b>	<b>4 099</b>
<b>TPC OPERATIONS</b>	<b>8 274</b>	<b>7 949</b>
<b>IRAP-TPC</b>		
SALARY	1 287	1 200
EMPLOYEE BENEFITS	257	240
NON-SALARY	620	560
<b>IRAP-TPC OPERATIONS</b>	<b>2 164</b>	<b>2 000</b>
<b>TOTAL OPERATIONS</b>	<b>10 438</b>	<b>9 949</b>

# Statement of Contribution Funding (\$000)

(FOR THE YEAR-ENDED MARCH 31, 2001)

	2000-2001	1999-2000
Contribution disbursements under TPC:		
Environmental Technologies	36 422	38 416
Enabling Technologies	64 403	48 979
Aerospace and Defence Industries	136 515	93 464
IRAP-TPC	25 475	18 943
<b>TOTAL CONTRIBUTIONS UNDER TPC</b>	<b>262 815</b>	<b>199 802</b>
Contribution disbursements under sunsetted programs:		
Defence Industry Productivity Program (DIPP)	55	77
Environmental Technology Commercialization Program (ETCP)	-	285
<b>TOTAL CONTRIBUTION UNDER SUNSETTED PROGRAMS</b>	<b>55</b>	<b>362</b>
Total contribution disbursements during fiscal year	262 870	200 164
Funds carried forward to future years	60 000	45 000
Funds not eligible for carry forward	8 888	6 626
<b>TOTAL CONTRIBUTION FUNDS AVAILABLE</b>	<b>331 758</b>	<b>251 790</b>

# Status of Contribution Portfolio (\$000)

	ACTUAL	PLANNED SPENDING			
	2000–2001	2001–2002	2002–2003	2003–2004	2004–2005
TOTAL PROGRAM FUNDING:	300 000	300 000	300 000	300 000	300 000
Funding from other government departments (1)	21 556	15 755	15 378	15 000	15 000
Allocation for program operations	(10 438)	(10 522)	(10 511)	(10 500)	(10 500)
Funds reprofiled to future years	18 139	28 056	61 520	1 492	768
Funds lapsed in 1999–2000 carried forward		30 000	15 000	–	–
Funds lapsed in 2000–2001 carried forward	(60 000)	–	–	60 000	–
Funds lapsed in 2000–2001 not eligible for carry forward	(8 888)	–	–	–	–
Repayable contributions collected in 2000–2001		3 885	–	–	–
Forecast repayable contributions	3 375	–	12 700	20 100	32 500
Transfers to DND/DFAIT	(233)	(567)	–	–	–
Program reductions	(400)	(6 000)	(6 000)	(6 000)	(6 000)
Other adjustments — operations	(240)	–	–	–	–
AVAILABLE CONTRIBUTION FUNDING	262 870	360 607	388 087	380 092	331 768
COMMITMENTS UNDER SUNSETTED PROGRAMS:					
Defence Industry Productivity Program (DIPP)	55	–	–	–	–
Environmental Technology Commercialization Program (ETCP)	–	–	–	–	–
TOTAL COMMITMENTS UNDER SUNSETTED PROGRAMS	55	–	–	–	–
COMMITMENTS UNDER TPC as of March 31, 2001:					
Environmental Technologies	36 422	33 050	24 796	20 318	12 424
Enabling Technologies	64 403	64 922	59 065	41 970	28 272
Aerospace and Defence Industries	136 515	172 658	157 485	79 322	36 577
Industrial Research Assistance Program (IRAP–TPC)	25 475	20 286	3 079	–	–
TOTAL COMMITMENTS UNDER TPC	262 815	290 916	244 425	141 610	77 273
TOTAL PORTFOLIO COMMITMENTS	262 870	290 916	244 425	141 610	77 273
TOTAL FUNDS AVAILABLE FOR NEW CONTRIBUTIONS IN FUTURE YEARS	–	69 691	143 662	238 482	254 495
FUNDS AVAILABLE FOR NEW IRAP–TPC CONTRIBUTIONS		15 246	27 821	28 000	28 000
FUNDS AVAILABLE FOR NEW DIRECT TPC CONTRIBUTIONS		54 445	115 841	210 482	226 495
	–	69 691	143 662	238 482	254 495

Note (1) Includes funds from the Climate Change Action Fund, the Canadian Landmines Fund and the Industrial Research Assistance Program (IRAP–TPC)



# TPC Partners in Progress 2000–2001

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Pierre Reid  
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National Defence

National Research Council of Canada

Natural Resources Canada

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Western Economic Diversification Canada

Government Partners

Department of Justice Canada

Environment Canada

Health Canada

Industry Canada

National Defence

National Research Council of Canada

Natural Resources Canada

Public Works and Government Services Canada

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