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AMERICAN TECHNOLOGY ALLIANCES

1996 Year End Report

NASA Cooperative Agreement
NCC4-101

Dryden Flight Research Center

Subject: Research on the Implementation of the NASA Joint Sponsored Research Program and Other Innovative Mechanisms for Commercializing NASA Funded Technologies.

Final Report Submitted July 1997

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BACKGROUND

This report delivers the highlights of work American Technology Alliances (AmTech) undertook between October 1995 and September 1996 pursuant to a Cooperative Agreement with Dryden Flight Research Center. The Cooperative Agreement called for continuation and expansion of the Joint Sponsored Research (JSR) Program activities at DFRC, specifically the ERAST Alliance, which is implemented through a JSR Agreement.

Pursuant to the Cooperative Agreement, AmTech's work focused on four main areas of investigation:

(1) Research issues arising from the implementation of the ERAST Alliance;

(2) Research issues regarding legal, intellectual property, financial, non-technical-management, and public policy to improve procedures and guidelines for use of the JSR Program;

(3) Research and test partnership facilitation techniques aimed at increasing R&D productivity and financial leverage, with particular focus in the areas of importance to the ERAST Alliance; and

(4) Examine and foster the commercialization elements of the ERAST Alliance activities.

A summary of activities and results in each of these areas is provided below.

1.0 ISSUES ARISING FROM IMPLEMENTATION OF ERAST ALLIANCE

1.1 Overview

The ERAST Alliance gave rise to issues in two primary areas. The first area concerns methods to increase R&D sharing and productivity among Alliance members who, though normally business competitors, are induced to explore the benefits of collaboration in the limited context of the ERAST Alliance. These issues are discussed below in 1.2 and 1.3. The second area concerns interpretations of the ERAST JSR Agreement pertaining to rights and responsibilities of ERAST Alliance members and policies and procedures required to operate a dynamic alliance involving multiple participants. These issues are discussed below in 1.4 and 1.5.

1.2 Financial Incentive for Program Performance

A Category B (i.e., principle company) member proposed the use of a financial bonus to incentivize company performance. The proposal raised both legal and pragmatic considerations investigated by AmTech.

On the legal side, AmTech's research did not reveal any government regulatory prohibitions against the use of a financial bonus under a JSR Agreement. However, there were concerns raised regarding whether this method of encouraging performance, ie., offering a reward for particular R&D outcomes, was allowable under a JSR Agreement, due to the somewhat specific nature of the JSR Agreement as contracting instrument. The JSR Agreement is a specially delineated class of NASA Space Act agreements. The NASA Administrator's delegation of authority concerning JSR Agreements characterizes the type of activity for which the JSR Agreement may be utilized as an "applied research project for the purpose of transferring existing or resulting technology for private sector use". Further, the delegation expressly prohibits use of the JSR Agreement "for the acquisition of property or services for the direct benefit or use by the United States Government." Some worried that the act of fixing clear-cut performance milestones and offering a financial reward for achieving them would make the activities indistinguishable from the government's normal business of proscribing and bargaining for specific results under a contract, thus prohibited by the authorization for JSR Agreements.

AmTech's research and analysis included discussions with the DFRC legal counsel and the ERAST Project Manager. AmTech's assessment is that a financial incentive for achievement of particular outcomes would not compromise the unique nature of the JSR Agreement because other characteristics of the JSR Agreement plainly distinguish it from procurement. Those other characteristics include the means of establishing milestones jointly between government and an industry group, the industry cost-sharing contribution, the lack of profit for industry, and the requirement that industry principals share project data.

Despite the lack of legal prohibition against it, AmTech raised pragmatic concerns regarding use of financial incentives. AmTech reviewed both human resources and employment compensation literature on salary incentives to identify their benefits and drawbacks in affecting group behavior. The literature showed that incentives, when used thoughtfully, are effective in incentivizing individual performance. However, they have the countervailing effect of causing competition between individuals. AmTech expressed reservations about introducing an element into the ERAST Alliance that could possibly reduce the emerging group cohesion among member companies, even if it otherwise resulted in outstanding performance for one high performing company. AmTech's literature research was summarized and is presented in Attachment 1.

1.3 Business Models for Group Development of Aircraft

In late 1996, ERAST Category B members began discussions concerning the joint design, fabrication, and testing of a new unpiloted aircraft capable of meeting certain performance parameters. In addition to the technical considerations required, the members discussed what form of business model would best suit such a collaborative undertaking. One notion was the formation of a formal legal corporation owned on a fractional basis by each of the four main players. The members required further information about this business model.

AmTech commenced this research by identifying a successful model which could serve as an operational example for the ERAST members to study and consider. AmTech choose a seminal example from the aeronautics field, Aerobus Industrie, SA, because it is a corporation owned and managed by a relatively small number of majority shareholders, engaged in work similar to that contemplated by the ERAST members. The research into Aerobus is summarized and presented in Attachment 2.

1.4 Rights to Tangible Property

One ERAST member required interpretation of Articles 24.01 and 24.02 of the ERAST JSR Agreement. Article 24.01 holds that the government has the right to take title to property purchased with government funds at the end of the JSR Agreement. This provision seemingly conflicted with Article 24.02 which provides that property developed by a company with government funding remains the property of the company. The issue raised was who--the company or the government--would own an item containing a mixture of property, some purchased and some developed by the company. More specifically, who would own an item, such as an unpiloted airplane, that was constructed by the company from raw materials purchased with government funding, and which may include some off-the-shelf goods purchased with government funds?

Based on analysis and discussions with the DFRC legal counsel, AmTech provided clarification of the ERAST JSR Agreement. AmTech advised the member company that Article 24.01 applied to purchases of end items and not items utilized as components of larger systems developed by the company. Thus, Article 24.02 pertains to items developed by the company, which may include components purchased with government funds. The test as to whether a piece of purchased property falls within 24.01, and therefore may be owned by the government, or within 24.02, and is therefore owned by the company, turns on whether the purchased article has lost its separate identify due to integration into property developed by the company.

1.5 Sales and Use Tax Exemption

A Member company inquired as to whether its purchase of materials required to fabricate an aircraft under the ERAST program would be exempt from California State sales or use tax. AmTech researched California law, and discussed the issue with the DFRC legal counsel before issuing a response. The Memo summarizing AmTech's legal research and opinion is presented as Attachment 3.

1.6 Overtime for Alliance Members

Alliance Members requested clarification concerning their ability to pay employees overtime on ERAST work. Working with the ERAST Program Manager, it was determined that overtime would be an allowable expense. This determination was based on the rationale that budget allocations to Alliance Members are fixed annually, thus Alliance Members have discretion as to how to expend their budget allocation in order to accomplish agreed upon tasks.

2.0 PROCEDURES AND GUIDELINES FOR THE JSR PROGRAM

2.1 Overview

Procedures for improving the operations of a JSR Program, such as the ERAST Alliance, were a major focus of AmTech's work. New members and activities were added to the ERAST Alliance, requiring procedures for expanding the membership and scope of work. As the ERAST Alliance matured into its second full year of operation, expectations for seamless financial transactions and project tracking increased both on the part of the NASA ERAST Program and the members. The specific areas of focus are described below.

2.2 Member Additions and Deletions

During the period of the Cooperative Agreement, AmTech developed procedures to incorporate four new members into the ERAST Alliance, including two small businesses, one university, and one consultant. Three of the new members joined established membership categories (two joined Category C, one joined Category E). One member fit none of the established membership categories and caused the formulation of a new membership procedure. This procedure involved creation of a special "Workshop and Special Projects" category, as well as the attendant contractual agreement necessary to connect the party to the ERAST Alliance.

At the same time, AmTech established the procedure by which two members of the ERAST Alliance, one Category C and one Category E member, separated from the ERAST Alliance and continued their activity under a separate JSR Agreement.

2.3 Improvements to Financial Management and Project Tracking

AmTech's responsibilities included the administration of ERAST funds to nine Alliance members and tracking of dissemination of project progress. These specific attributes were enhanced:

(1) Task and Funds Mods--A major precept of the JSR Program has been that the NASA Program Manager obtains greater control and flexibility in project management by maintaining direct authority over contracting decisions and utilizing the Facilitator as a key component of financial management. This contrasts with NASA's traditional contracting method, where the Program Manager is disassociated from contract management, relying instead on NASA contracting and financial management officers to administer the contract and funding. A key finding regarding Alliances is the more complex environment caused by multiple partners undertaking interlocking work results in relatively frequent need for modifications to statements of work and funding allocations. These adjustments proved easy to accomplish with the unique JSR Program administration system. By developing a simple written instruction form, known as the Business Plan (BPMod), AmTech could receive instructions from the Program Manager to immediately implement modifications to members' work plans or budgets. Based on AmTech's recommendation, the NASA Program Manager reduced from thirteen to five the number of ERAST tasks and this substantial change was rapidly implemented through the BPMod system.

(2) Expenditure Verification--AmTech developed a system for rapidly reconciling monthly invoices received from Alliance members and obtaining NASA Program Manager authorization for payment. Invoices are carefully reviewed for accuracy, and any irregularities are brought to the Program Manager's attention. The time period from receipt of invoice to

payment of funds through the HHS (Health and Human Services) was substantially reduced (by approximately two weeks) by development of this system.

(3) Budget Status Reports--In response to the need for closer financial analysis, AmTech developed and regularly produced types of financial report. One type, a monthly budget report, is provided to the NASA Program Manager semi-monthly, showing budget vs. actual expenditures for each task, remaining funds balance per task and for the Program, and the percentage of funds disbursed to date. The report also shows the cumulative total of invoices received to date and the amount of each company invoice received. Alliance Members were provided quarterly reports showing all of their respective invoices paid during the quarter and a their actual expenditures compared with the budgeted amount.

(4) Financial Forecasting Tool--AmTech developed a spreadsheet program that permits the NASA Program Manager to visualize the flow of funds over the annual period and model possible funding modifications.

(5) Progress Reports--AmTech implemented procedures that provide the NASA Program Manager with GANT chart information, plotting Members' milestones over time. Monthly progress reports are regularly disseminated to specified Alliance Members.

3.0 PARTNERSHIP FACILITATION

3.1 Overview

During the 1995-1996 timeframe, AmTech worked closely with the Sensor Element Manager of the ERAST Alliance on methods to increase information sharing among leaders in various subject matter areas. In addition, AmTech focused on means of increasing compatibility and information sharing among Alliance members.

3.2 Sharing Among Subject Matter Leaders

AmTech supported three two-day technical workshops on various topics of importance to ERAST: (i) Sensor Miniaturization; (ii) Propulsion; and (iii) Data and Communications. The support included full planning and staffing of events.

3.3 Sharing Among Alliance Members

AmTech supported two ERAST Business Meetings, with full planning and staffing of events. AmTech sponsored special segments of the Business

Meeting geared to increasing rapport and enthusiasm for partnering between Members.

3.4 Testing the Value of the Alliance

AmTech interviewed Members of the ERAST Alliance to ascertain their views concerning the value to them of working collaboratively under a JSR Agreement. AmTech interviewed the NASA Program Manager and Category B Members. The key finding is that each Alliance Member acknowledged an initial sense of reluctance to share information with other Alliance Members but reported that, over time, this hesitation was being overcome by a recognition of the benefits to be gained from collaboration. Further, numerous Alliance Members endorsed the Alliance as an important new way of doing business. Excerpts from AmTech's interviews are presented as Attachment 4.

4.0 COMMERCIALIZATION

4.1 General

AmTech supported commercialization of the ERAST Alliance technology through three primary areas, described below.

4.2 ERAST Alliance Exposure

AmTech assisted in efforts to increase public awareness of the ERAST Alliance, the current capabilities of its Members, and the potential civil and commercial uses of ERAST unpiloted aircraft. In particular, AmTech worked closely with Alliance Members to develop presentational materials for an ERAST booth, which was displayed in three conventions during the period of the Cooperative Agreement.

4.3 Multimedia Presentation

AmTech proposed the development of multimedia materials to portray various aspects of the ERAST Alliance to enhance commercialization. AmTech developed a draft video product (draft script presented as Attachment 5).

4.4 Hurricane Task Force

AmTech worked closely with ERAST Alliance Members on investigating a possible commercial application of unpiloted aircraft for hurricane tracking. (Briefing presented as Attachment 6). AmTech's initial efforts developed into a long-term ad hoc committee of the ERAST Alliance. Various business models and potential clients have been identified.

SUMMARY

AmTech's investigations under the Cooperative Agreement demonstrate the multifaceted aspects of a major project operating under the NASA JSR Program. The research reveals that Alliance Members, i.e., participants in a JSR project, report considerable and unexpected value from working in a collaborative manner with each other and with the government. The research also shows the flexibilities in agreement administration permitted by the JSR Agreement are highly useful to supporting collaborative work, which by its nature is complex and subject to modification. Additionally, AmTech's research reveals the kind of policy and procedural issues and determinations that are required to maintain an operational Alliance. Finally, AmTech's work highlights the commercialization possibilities of unpiloted aircraft technology, and suggests a course of action for building commercial and civil customers for ERAST technologies.

ATTACHMENT 1

MEMO

RE: Summary Of Literature On Incentives

I. P RO S

The articles mention a number of reasons why employers offer incentives to their employees. These reasons include: Improved quality of work; Enhanced effort; Increased productivity; Motivation; Recognition for excellent work; Increased opportunity; Employee focus; Competitive edge in the industry.

The following are some hints in creating a successful incentive program:

- People view the achievement of objectives as "what is in it for me". The program must offer people a reason to remain committed and involved in the process over a period of time.

- Open communication to increase employee awareness of the company's needs and how they can have an impact.

- Assure the same opportunity for all.

- Clear and easy to understand system of rewards.

- Clearly defined and measurable goals.

- Tie payment to performance so that individuals will relate closely to the success of the company.

- Focus on future goals rather than rewarding improvement over past performance.

-The system should encourage initiative, decision-making, ingenuity and aggressiveness.

II. CONS

- Incentives do not encourage and reward coordination and teamwork.

- Incentives make others who have not attained the goals feel inadequate.

- Discord is created through internal competition. This means that companies are creating the obstacles to their own success.

- Employees are tempted to conceal problems in order to appear in control of the situation. They will refuse to ask for help from others.

- When the rewards run out, people revert to their old behavior. The key is to alter attitudes which will provide long term results.

- There are studies that show less employee productivity when rewards for production and efficiency are offered.

- In a survey of what matters to employees the most, pay usually ranked fifth or sixth.

- If compensation is below normal then people are disgruntled which affects their productivity. However, if compensation is far above average then there is no sign of higher quality work.

- Incentives are manipulative which is bad for morale over time.

III. CONCLUSION

The bolded findings strongly suggest the use of financial incentives within the ERAST Alliance may have unintended negative effects of reducing team cohesion and overall group performance.

ATTACHMENT 2

RE: Airbus Industrie

I. Introduction

This memo will examine the organization and structure of Airbus Industrie (AI), the world's second largest manufacturer of large aircraft. AI was formed under French law on 12-18-70 as a Groupement d Intérêt Économique (GIE) and is headquartered in Toulouse, France. AI is currently owned by Aérospatiale of France (37.9%), Deutsche Aerospace of Germany (37.9%), British Aerospace of the U.K. (20%) and Construcciones Aeronauticas, S.A. of Spain (4.2%). Under a GIE each member maintains its separate corporate identity while working with the organization. The members are essentially subcontractors who bid against each other for the right to design and manufacture the various aircraft components at their own factories and then ship them to Toulouse for final assembly. This places the members in competition with each other, but it was believed to spark creative tension between them which would generate innovative and effective solutions to technical and commercial challenges.

AI was to assume leadership and coordination of specified aerospace projects and derivatives of the members. This includes design, development, certification, manufacture, marketing, product support, maintenance and all related activity. AI hoped to introduce a commercially attractive product that would combine the talents of each member while assuring that the interests of the consortium's members are served as completely and equitably as possible.

II. Background

In order to understand the choice of organizational structure and operational procedures designed to meet AI's objectives, it is necessary to examine the context in which AI was conceived. AI was formed by France and Germany in response to U.S. dominance of the aerospace industry after World War II. The aerospace industry was seen as crucial to the national interest of European countries for military and economic policy reasons. The aircraft manufacturers in Europe discovered that they could not compete against the resources of the U.S. individually so the industry leaders concluded that it was necessary to collaborate The nature of the connection between state and industry in post World War II Europe allowed the interested countries to back the project financially in order to get new projects up and running and attract customers. In June, 1971 the relationship between the companies and their governments and the terms on which development was to take place were elaborated in a "Convention Cadre." It stipulated that each of the member countries would enter into a national financing agreement with its manufacturing company, and that each of the companies would in turn enter into an industrial agreement with AI. A compelling rationale was needed to justify the expense, risk and frustration inherent in collective action and American dominance of the aerospace industry was it.

III. Choice of Entity

The initial problem was how to form an organization that would be able to respond to market conditions quickly and efficiently despite cultural, language and distance barriers. Each country had differing views on how to structure AI. The German contingent wanted limited liability. They were a group of independent firms who wanted protection from AI's creditors. The French contingent wanted each company to be liable in order to show potential customers that AI was committed to the venture. The French were government owned and backed (93% owned by France with the remainder being held by a private holding company) so they were not as concerned about liability. They felt that unlimited liability backed by intergovernmental agreements against

default would provide consumer confidence in AI which would attract customers despite the poor track record of large collaborative efforts.

Another concern of both countries was the potential of having its companies controlled by foreign interests. One member in a collaborative effort usually takes a leading role and winds up dominating the enterprise. With these considerations in mind, the members finally agreed and formed a GIE under French law with Aérospatiale and Deutsche Airbus being the initial partners with equal shares.

A GIE is a business organization that permits firms to integrate their activities in certain domains while preserving their individual identities. A GIE is an unlimited partnership in which the partners are corporations. But even though the partners remain separate corporate entities, they are responsible both individual and collectively regarding the obligations incurred through their shared business venture. Creditors are therefore able to take action against an individual member if they fail to get payment from the GIE itself. (No such case has ever arisen, but this could in theory make membership of the GIE unattractive to a partner who had only a small share i.e. Spain with its 4.2% share).

AI was set up so that new members are admitted, and member's rights are adjusted, with the unanimous consent of existing members. Unanimity is also a requirement for the assignation of membership rights to third parties or other members. It is also dictated that no member may withdraw before the company has achieved all of its objectives and performed all of its obligations. A new member assumes liability not only for future debts but also for any that already exist, and a member that formally withdraws remains liable for any debts existing on the effective date of its withdrawal.

Other salient features of a GIE include the absence of tax liability on the GIE itself and no proprietary capital of its own. Costs, revenues, losses and profits flow though to the partners and any taxable consequences are borne by the corporations under the laws of the state under which they are incorporated. The accounts of a GIE can be thought of as a sort of internal ledger in which there is a record of its revenues and expenses and of its transactions with its members. The financial status is reflected in the accounts of the individual members of the consortium. Industrial and financial results of GIE activity are considered an integral part of the partner's overall business activity and need not be accounted for or reported separately. This makes it very difficult for outsiders to get detailed information concerning the GIE's operations. Its accounts are subject to external audit, but not to any form of compulsory publication or general disclosure to third parties. This privileged status continued even after 1985, when the rules governing all regular French companies, public or private, were revised and the publication of annual financial statements was made a legal requirement.

A GIE is managed by one or more directors nominated by the members in a general meeting. In dealing with third parties, a director binds the GIE by any act within its corporate objectives and that any limitation of a director's power is invalid against third parties.

The flexibility of the GIE is well suited for international ventures in which firms not interested in merger wish to coordinate activities with others while avoiding the sunk costs and tax consequences of an incorporated joint venture. The GIE is specifically aimed at making it easier to set up cooperative ventures by endowing a GIE with full corporate personality and legal capacity while providing substantial flexibility in matters of organization and administration.

IV. Original Organizational Structure

The 1970 agreement contained regulations which established the organizational structure of AI. AI was to provide effective oversight of all phases of the project and would deal exclusively

with all third parties i.e. new customers and major subcontractors. Atop the structure was the Assembly of Members and then came the Supervisory Council and the Managing Director.

The Assembly of Members consisted of two representatives from each partner and its vote was required on important matters such as new programs, modification of the statutes of the GIE, admission of new members or anticipated liquidation of the venture. The Supervisory Council consisted of five members from both partners who were appointed for five year terms. The Managing Director was appointed by the Assembly of Members in a general meeting for a period of five years. This established a separation of powers over the operations of AI between the Supervisory Council and the Managing Director.

The Supervisory Council's role was to supervise the operation while the Managing Director had the power to implement decisions. The Managing Director was to carry out the objectives of the GIE, attend the Supervisory Council's meetings and to make sure the directives of the Supervisory Council were realized. The Managing Director had authority over the major areas of operation i.e. technical, production, administration, finances, marketing and after-sales service. Each of these areas had its own director who was designated by the Managing Director with the approval of the Supervisory Council.

AI was structured this way in order to share the power between the Supervisory Council and the Managing Director, making each reliant on the other for its actual exercise. There was great potential for gridlock in such divided authority so the regulations also included explicit provisions for resolving differences among the partners such as procedures, timetables and the appointment of an outside arbitrator to settle disputes.

The structure proved to be very inefficient. AI evolved into seven products, four partners, two associate members and an international network of subcontractors. The decision-making process was time consuming and full of bureaucratic red tape. It was especially difficult to get new projects moving forward. There were four different governments and partners pulling in different directions and domestically each has to operate in different political climates. AI had achieved a substantial market share, but it was not making a profit so AI was reorganized in 1989 which will be discussed below.

V. Operations

In order to foster the creative tension that was essential to making the collaboration work, competition between members was woven into the fabric of the organization. The bids each member makes for a component must specify the precise materials, cost and delivery schedule a member can provide. The other members then closely examine the submitted bid and question it extensively. AI acts like an arbitrator in these meetings as the members battle back and forth seeking to get the best price for themselves while keeping it low enough to be accepted by the group.

This creates a paradoxical situation as the partners essentially act as the prime contractors to an entity of their own making. The result of this situation is that members have interests that coincide and conflict. They each want the costs to remain low so that AI does well, but they also want the maximum possible income for themselves. Partners play roles that are cooperative and adversarial. Everything is questioned so it forces each partner to improve itself and thereby AI. On the other hand, members are unwilling to reveal new methods of efficiency because they would be forced to reduce their bids and would be giving their trade secrets to the competition.

After the launch of a program, AI allocates research and development activities in accordance with the member's percentage of ownership. Development and other nonrecurring costs i.e. engineering and tooling, are negotiated with the members and allowance is made for a

margin of profit. A portion of the price agreed for nonrecurring costs is recovered by the members with each shipset delivered. Production work also has to be allocated and the members quite often subcontract their accepted bids to others. Complete subassemblies are manufactured in each of the four partner companies and are then flown to Toulouse for final assembly, AI taking title from the member companies when the subassemblies are en route to France. AI then sells the aircraft, provides pilot and crew training, insures the availability of spare parts and develops maintenance procedures and literature.

AI is in essence a management company, responsible to the partners for resolving problems that relate to the total program, but it has a number of activities in its own hands under the industrial agreements with the members. Market studies, aircraft sales and financing, supervision of design and development and contract administration were all retained by AI, as were advertising and public relations. It was also determined that certain functions relating to production were best performed at the center. Engine procurement fell into this category as well as flight testing and aircraft certification. Certain operations in the technical area were also retained, such as the publication of technical materials and spare parts and maintenance support.

This system has been criticized for causing over management; that the nature of the partnership not only adds a tier to the management structure of the consortium, but also adds to the high costs of the corporate bureaucracy that had emerged at Toulouse.

VI. Financial System

As noted above, AI does not have one set of books for the entire operation since it is a GIE whose activities do not have to be reported apart from the members. The prices charged by the partners provide the basis of an invoicing system linking AI to the partners. AI keeps a detailed set of accounts for itself and each of the partners which tracks delivery of components and the disbursal of funds. Invoices are reconciled every ten days and moneys are either allocated to or requested from the partners with the balance going to the purchase of large items sourced from outside i.e. engines and overhead expenses. At the end of the financial year, AI divides a profit or loss according to the member's share of AI.

AI receives funding through several sources. It receives payments from members on a budget proposed by AI and approved by the Supervisory Council. These payments provide for the purchase of major equipment and overhead. Nonrecurring development costs and production funding are borne by the members. Once the member's bid is accepted it is individually responsible for producing that component. Each member is also required to finance the research development of those components. This is usually no problem since the members have financing agreements with their respective governments.

In order to ensure an equitable distribution of government resources, the interested states work with each other to provide the appropriate funding. This ensures that no single member can dominate AI by being provided with inordinate amounts of capital from its home country. Towards that end the states initially signed a memoranda of understanding which committed them to the project in broad terms and then entered into intergovernmental agreements which govern the contribution each state makes to project development.

VII. Reorganization

AI was not being run as a corporation out for profit. AI's objective when it was created was to compete with the Americans. They simply wanted to produce and sell large numbers of aircraft with little regard to AI's operational efficiency. The members were backed by financing agreements with their respective governments so there was little concern about lack of capital. In April of 1988 a commission was formed to review the structure of AI. The commission issued a

detailed report which concluded that the administrative body was too big to operate efficiently and that the financial system was problematic because of the absence of a consolidated balance sheet showing the financial status of the entire operation. The commission set forth a number of suggestions on how to improve AI.

The commission identified several problems that were attributed to a lack of adaptability and organizational inefficiency. The first problem was that there was a lack of correlation between the marketing of the aircraft and the financial aspects of the programs. This was attributed to the fact that sales and support were essentially an AI responsibility, whereas the four industrial partners negotiated prices amongst themselves, but kept their costs hidden. Secondly, it noted the absence of an overall balance sheet at the AI level which meant that both AI and the governments lacked what they termed "objective decision-making criteria." Thirdly, it remarked on the proliferation of committees within AI and the general unwieldliness of the organization, observing that the rule that required decisions to be backed by shares representing 81% was the equivalent of a unanimity requirement which made for a very time consuming ratification process. (The 81% requirement was instituted with the addition of new members into AI.)

The commission stated that "What is required is an AI structure which would be more responsible for all parts of the programs, more concerned with profit and loss, and less dependent in its day-to-day operation on each industrial partner. The partners, on the other hand, need to control more closely AI's decisions, since they bear all the risks."

The question of structure was paramount. The commission wanted to set AI up as public limited company (PLC), but it concluded that it would take a long time and would pose thorny problems of valuation and capitalization considering the mix of private and state owned companies. Given the present level of AI activity, it would also be difficult to envisage an immediate positive cash flow, and that implied that for some years it would be necessary to make injections of capital.

To pave the way for a transition to PLC status, it would be necessary to devise an improved management structure to enable the consortium to compete successfully in the market place. This required that relationships between the partners and AI become simplified and streamlined so the commission issued a number of recommendations.

The first area addressed was the Supervisory Board which had grown to 20 members. It met roughly twice a year and its main function seemed to be to ratify decisions made elsewhere. It recommended that the Supervisory Board should become the main instrument of policy of the consortium as a whole by playing a more dominant role in decisions about programs, cooperation agreements and strategic control not just in Toulouse, but in the partner companies. It should be reduced in size to consist of only five members, the president of AI and the presidents of the four partner companies. If the occasion demanded, it ought to meet on an ad-hoc basis and dispatch urgent business and to make that easier, alternates should be appointed and given authority to speak for their companies.

The commission recommended that the Supervisory Board should meet at least four times a year and should be involved with all matters relating to the launching of new programs and the subsequent decisions of work-sharing. Major decisions about new programs (or the cancellation of existing ones) should be made on the basis of partnership shares and require a 75% vote in favor; other major decisions should be on the basis of a simple majority of partnership shares; all other matters should be determined by a simple majority between the presidents.

The commission also recommended that an Executive Board be created in order to manage the day-to-day operations of AI. In order to provide the most effective representation, the commission recommended that the Board consist of a senior manager from each of the members and three representatives of AI (the Managing Director, the Finance Director and a commercial

officer). The partners were urged to appoint as their representative the most senior man within their companies with day-to-day responsibilities for AI activities and to regard them as plenipotentiaries.

The Executive Board should hold monthly meetings and in the absence of a consensus should generally reach decisions by a simple majority vote. An exception to this was made in the case of certain decisions with financial consequences for the companies, and here at least two partners controlling at least 51% of the shares must be in favor.

The next area the commission examined was finance. The central accounting of AI was restricted to the management accounts of AI in Toulouse which covered only the sales and service functions. The AI books of partners were not open either to their fellow partners or to AI. The report recommended that a financial officer be appointed to make a more rationale accounting system. For the financial officer to be able to carry out the role envisaged for him, it seemed to the commission that it would be necessary to establish a central accounting system comparable to that existing in the head office of a PLC.

It was recommended that the financial officer should head an accounting function separate from any other central administrative within AI. The accounts of the members and of AI itself should be made fully available and the officer should have full control over all cash-flows within AI.

The appointment of a Financial Director who was to have access to all the books was met with great animosity from the members. The members do not want anyone from AI examining their books for fear that it would put them at a disadvantage when they are negotiating for prices and feel that internal information could be used against them in the bidding process.

Another issue was that of employment structure. It had been a system of temporary transfer from the partners to AI. This was thought to result in a lack of commitment with prime loyalties remaining with the parent companies. The commission wanted to see the introduction of employment contracts directly with AI. They believed that this would lead to the evolution of a career structure and that this would be good for morale and foster a strong spirit of cooperation.

The commission also wished to see an end to the practice of reserving certain key positions within the consortium for individuals of specific nationality; hiring and promotion, especially of high-level executives, should be based on merit alone.

The commission made a number of other recommendations on specific financial and management issues. The partners try to ensure that their share of work is at least equal to their partnership share in the consortium so that any losses incurred as partners could then be made good by profits earned as subcontractors. This leads to a lot of side deals which hurt AI as contracts are not going to the best supplier on many occasions. The commission recommended that in the future, profits and losses should be apportioned in accordance with the partners' invoiced work-share and not in proportion to their partnership shares.

Another issue was the way in which funding for modifications was provided. All development work took place at the partners' factories and the funding for it came from the partners or their governments. The inflexibility that this gave rise to had led to a good deal of frustration and the commission recommended that the Supervisory Board should make a certain sum of money available (a figure of 5% of total development funding was suggested) so that modifications could be developed to solve design problems as they arose and on the initiative of the Executive Board.

Subcontracting was another area in which there seemed to be a need for greater flexibility. The commission urged the introduction of a system that, while guaranteeing each company

subcontract work up to an agreed proportion of its partnership share, would leave the rest to be awarded by the Executive Board on a competitive basis. This could greatly enhance the cost efficiency of AI.

Another recommendation related to export credit. The existence of four separate corporate credit agencies in the member countries resulted in inefficiency and delay and put AI at a disadvantage in competing with the Americans. They recommended the creation of a European import-export bank to provide full credit facilities comparable with those available in the United States.

AI acted upon the commission's report and on April 1, 1989 AI reorganized its structure in order to give AI a more streamlined decision making process so that AI could react swiftly to market developments. The Supervisory Council was reduced to five total members. An Executive Board was established to control the day-to-day operations and beneath it are senior vice-presidents in charge of various functions i.e. commercial, engineering, technology. A Financial Director was appointed in order to review the accounts of AI and the members, but there has been little success in his attaining the records of the members as of 1995 due to their desire for financial secrecy in the bidding process. Other recommendations have been established or are still being analyzed.

VIII. Conclusion

The organization, structure and context in which AI was formed makes it a unique entity. The success of the international industrial collaboration that was initially formed by France and Germany to meet the challenge of U.S. dominance of the aerospace industry has been remarkable, but the policies of a "Fortress Europe" have played a key role which must be considered when evaluating how AI was able to succeed when so many other collaborative efforts have failed.

ATTACHMENT 3

MEMO

SUBJECT: Sales and Use Tax Exemption

I. ISSUE

The question is whether an ERAST Member company's purchase of property necessary for fabrication of an aircraft built pursuant to the ERAST JSR Agreement is exempt from California State sales or use tax.

II. ANALYSIS

California law provides an exemption from sales and use tax for purchases made by agents of the U.S. government (i.e., contractors) acting on behalf of the government. A critical determining factor is whether title to the purchased property will ultimately rest with the government. The law provides for an exemption from sales and use tax if title to purchased property vests with the government. Much of the law in this area deals with when title vests with the government, and how to ascertain this if the contract between the government and its purchasing agent (the contractor) is silent on who will take title and when.

The following case law and regulations clarify the rules pertaining to various fact patterns:

According to *Lockheed Aircraft v. State Board of Equalization (1978)* 81 Cal. App.3d 257 [146 Cal.Rptr. 283], an exemption from sales and use tax is allowed if title to the purchased materials vests with the government. The exemption applies even if legal title is vested with the government but possession of the materials remains with the company who purchased them.

California Revenue and Sales Tax Code 6381 provides the exemption for purchases of property made by U.S. Government contractors under government supply contracts. A U.S. Government supply contract is defined as a "contract with the U.S. to furnish, or to fabricate and furnish, tangible personal property including ships, *aircraft. . .*, whereby title to tangible personal property purchased for use in fulfilling the contract passes to the U.S. pursuant to the title provisions contained in the contract before the contractor uses the property to perform the function or act for which the property was designed or manufactured. Cal. Code Regs, tit. 18 §1618 (a)(1).

Further, the exemption applies to "supplies, tools, or equipment consumed in the performance of a contract which are specifically identified to the contract and the actual cost of which is charged as a direct item of cost to the specific

assertion of title to the aircraft, irrespective whether the aircraft were in the possession of the government or the Company who developed it.

ATTACHMENT 4

THE BENEFITS OF PARTNERING

Statements from the participants of the ERAST Alliance

TOM CLANCY, ERAST PROJECT MANAGER
AURORA FLIGHT SCIENCES

The whole idea behind ERAST is that we have an agreement that allows us to share data, share our ideas in a way that's not competitive to each other and it turns out to be very constructive for the industry that is trying to develop these unmanned aircraft for various reasons.

DOUG SHANE, ERAST PROJECT MANAGER
SCALED COMPOSITES

I've been able to pick up the phone and call a colleague at AeroVironment, Aurora and General Atomics, and research a problem, find out what their experiences have been, and been able to solve problems much more quickly than otherwise we would have been able to do. I think its really been one of the best things about the Alliance.

JENNY BAER-RIEDHART, NASA PROGRAM MANAGER
ERAST PROGRAM

We're actually looking at leveraging the partnership activity in a Joint Sponsored Research Agreement, and that in itself is a real experiment and a challenge, because what you do is ask competitive companies to work together and share information for the good of the group, and also asking the government to step back, not in a leadership, writing the requirements role, but as far as a supportive role in the industry in developing these technologies. There's a real paradigm shift that has to be done on this Program, and I think we've seen that and are working with it each day.

BURT RUTAN, PRESIDENT
SCALED COMPOSITES

Working with the ERAST Alliance, we've been able to share ideas relative to flight control concepts, we've been able to share hardware development, including flight control hardware, and also propulsion technologies, and also our approaches to the ground station are ones that we've been able to pass on to our other teammates.

JEFF SPITZER, ERAST PROJECT MANAGER
GENERAL ATOMICS AERONAUTICAL SYSTEMS

There's a lot of technology being shared and leveraging of technologies between the companies.

JOHN LANGFORD, PRESIDENT
AURORA FLIGHT SCIENCES

The Alliance is an unusual experiment in how you take a fundamentally free market system and make it cooperative in a way that preserves the competitiveness of each of these four companies involved here...they are arch enemies of each other in one respect, they compete against each other, and yet they are all very small players in the world of aerospace and the question is, how do you grow the next generation of aerospace companies? It's an important thing for the country's economic development, you don't want the government making choices about who is going to be a winner and a loser, you get money but you don't, those are decisions you want the marketplace to make. The U.S. has to find innovative ways to help grow the next generation of the aerospace industry. ERAST is an important innovative experiment in that direction.

RAY MORGAN, VICE PRESIDENT
AEROVIRONMENT, INC.

The Alliance has provided a unique opportunity for competitors in an industry that is noted for 'not invented here syndrome' to share information for mutual benefit...it is a rebirth of the old traditions that made the United States a world leader in the aeronautical arena...

ATTACHMENT 5

ERAST SCRIPT

I. INTRODUCTION

VO: Antarctica. It was a dangerous mission, but we needed to know the truth. Far above the icy waters, a pilot, alone in his plane, gathered the evidence that brought shocking news to the whole world: a hole in the ozone layer above Antarctica. Although very risky for the pilot, flights would continue for a ten year period, from the 1980's into the 1990's. The data was essential, and there was no other way to collect it.

Pilot Jim Barriolleaux flew most of the antarctic flights, jeopardizing his own safety because of the importance of the scientific mission:

BARRIOLLEAUX: *The polar missions have the most risk. Sometimes we constrain missions to maximize the chances that something won't go wrong, and keep the mission relatively simple to prevent any errors occuring that would put the pilot in a position that ultimately led to departure of the airplane, because now you're in a survival kind of scenario. We don't consider an ejection, or at least, once you arrive on the surface, whether that be on the water or the ice, to be survivable.*

II. ERAST ALLIANCE

VO: The need to understand changes occuring in the earth's atmosphere is with us, today. More flights are required. But the flights are dangerous, and safeguarding the pilot places inherent limits on the science missions. In response, the National Aeronautics and Space Administration, NASA, proposed utilizing an unusual kind of airplane, one without a pilot. Called a RPA, for remotely piloted aircraft, the airplane's pilot remains on solid ground and controls the airplane's flight through radio transmitted commands.

NASA decided to launch a new effort in 1994, aimed at perfecting UAV's for high altitude scientific missions. NASA named this effort, the environmental research aircraft and sensor technology alliance, which is now known simply as the ERAST Alliance.

NASA's ERAST Program Manager, Jenny Baer-Riedhart, explains:

JENNY: *The goals of the ERAST Program are to develop technologies through flight demonstrations of very high altitude remotely piloted aircraft so that they can be used as sensor platforms for scientific missions...*

propeller driven by a supercharged engine. For range and endurance, the engine is airbreathing, providing for full propulsion power from sea level to very high altitudes. The engine is a spark ignited gasoline engine, pressurized with multiple stages of turbocharging. Compared to other engine types, the ERAST power plant consumes less air relative to the amount of power produced. The air is compressed and then cooled to room temperature with large heat exchangers. The ERAST three stage turbocharged engine is currently being prepared for testing in an altitude chamber, and will later be tested in actual flights.

Another technical challenge is the solar-powered airplane, and its energy-storage system. Ray Morgan, designer of the solar-powered Pathfinder airplane:

MORGAN: *To fly on solar power, it necessitates that the airplane be extremely light or it won't work because we get relatively little power from the sun for the area of the wing. And such an airplane inherently flies slowly and is therefore very susceptible to turbulence. I think we've proven that the design concept is within reasonable conditons operationally viable to fly up to high altitudes and safely return it . The flight speed range is at sea level between 24 and 33 feet per second, so the maximum speed in nautical terms is about 20 knots at sea level. At 65,000 feet, the speed would be about 65 knots. In theory we should be able to get the airplane to about 65, 000 feet in the summer months in this area. And also, we hope to build an airplane about twice this size that can stay up continuously by charging an energy storage system during the day from the extra solar array that would be available and using that power to maintain our altitude at night, and thereby stay up almost continuously.*

VO: Another technical focus for the ERAST Alliance is on improving the science instruments that will be carried by the unpiloted aircrafts. The objective is to make the instruments, also called sensors because they detect atmospheric gases, lightweight and small.

WEGENER: *Every pound we can knock off of payload is really 6lb in terms of structure and other support facilities on the aircraft. Miniaturized instruments use less power, smaller generators, they generate less heat, less need for cooling or heating; so its very much to the advantage of the science community to go with smaller instruments, it really benefit the airframers, it just makes a big difference all the way around.*

VO: Already, NASA's sensor developers have dramatically reduced the weight of certain instruments, for example, the Argus instrument which measures N20 and methane gases, once weighed 250lbs, but today weighs only 50lb. Steve Wegener is hoping to further miniaturize the Argus, making it no bigger than a shoebox, and weighing only 5lb.

WEGENER: *To make this quantum leap in downsizing, miniaturizing instruments, its more than just a technological leap, its a mindshift, we need to find new concepts, new approaches, in making these measurements. Right now, it looks like were as far as you can go with optical instruments, given pathlinks and attenuation you have bouncing lasers off of mirrors. We can go to new concepts in making these measurements, and actually realize some of these quantum efficiencies that we need to have truly miniaturized instruments.*

VO: Just as NASA hoped, working these sorts of problems together has proven very effective for the members of the ERAST Alliance.

IV. PARTNERSHIP

MORGAN: *First off, ERAST Alliance gives us the chance to start really developing a sharing of information that will promote the industry of unmanned aircraft, remotely piloted aircraft. What I'm hoping is this ERAST Alliance, focusing on the primary mission of doing environmental research, can be not only a good entity for achieiving those goals but also will promote the industry of remotely piloted aircraft by making each of the constituent companies better equipped by not having to learn everything the hard way. They can benefit from each other's experience and then focus of the new problems that haven't been solved before.*

RUTAN: *Working with the ERAST Alliance, we've been able to share ideas relative to flight control concepts, we've been able to share hardware development, with flight control hardware, and also propulsion technologies, and also our approaches to the ground station are ones that we've been able to pass on to our other teammates.*

SHANE: *I've been able to pick up the phone and call a colleage at AeroV, Aurora, and General Atomics, and research a problem, find out what their experiences have been, and been able to solve problems much more quickly than otherwise we would have been able to do. I think its really been one of the best things about the Alliance.*

JENNY: *I think it does give you a different way of doing things, especially when you're looking at technologies that are much further reaching, to where you need to have a group of people working together on a Program, rather than a real defined set of requirements.*

CLANCY: *The whole idea behind ERAST is that we have an agreement that allows us to share data, share our ideas in a way that's not competitive to*

each other and it turns out to be very constructive for the industry that is trying to develop these unmanned aircraft for various reasons.

LANGFORD: *The Alliance is an unusual experiment in how you take a fundamentally free market system and make it cooperative in a way that preserves the competitiveness of each of these four companies involved here...they are arch enemies of each other in one respect, they compete against each other, and yet they are all very small players in the world of aerospace and the question is, how do you grow the next generation of aerospace companies? It's an important thing for the country's economic development, you don't want the governmet making choices about who is going to be a winner and a loser, you get money but you don't, those are decisions you want the marketplace to make. The U.S. has to find innovative ways to help grow the next generation of the aerospace industry. ERAST is an important innovative experiment in that direction.*

RISA: *When NASA first approached us and asked us to guide them in forming the Alliance, they were very apprehensive about the companies' willingness to work together. NASA was right. I remember my first meeting with the companies. They all wanted to go it alone. They were prepared to have competition where one, and only one company would be selected for the task. They couldn't embrace cooperation. When I structured the agreement between them and NASA, I really tried to address the concerns they all had. It was a balancing act, but I feel we arrived at a flexible arrangement that works. Over time, both NASA and the companies have come to realize the benefits of partnering. And we were very excited when they did, because it was immediately clear that this premier group could jointly produce a fleet of reliable remotely piloted airplanes, and that would open the door to civil and commercial uses of the airplanes. What we see is a new industry in the making...*

V. CIVIL & COMMERCIAL USES

VO: Indeed, the prospects abound for using UAV's in ways that are important to everyday life. Ideal as platforms from which to view the earth, UAVs offer immediate benefits to agriculture and other land management interests.

BRASS: *You can go right down the list: forestry applications, mapping trees, mapping vegetation, looking for stress over large areas can be done easily with RPA's. In the agricultural community, again, mapping crops, looking for stress in crops, looking at productivity over large areas,. Its going to be completely valuable not only to the farmers themselves, but to the marketing community, how much we are producing and where that production is being done. In disaster assessment, we see that RPA's can give us the opportunity to look at a large event for a long time, for a long duration.*

Fire is an example. We can stare at a fire over a few days. Its giving us a more complete look at it, where that fire is going, how the intensity is changing, and if management is having a particular effect on a given fire event, or on a confluence of fires.

VO: Consider the advantages remotely piloted airplanes represent to communities that suffer damage from fires and other hazards. James Brass, a frequent advisor to federal and state forestry and fire departments, discusses fires in California:

BRASS: *If you look at what is spent, quote, on an average, and this would not be like 1993 when we had 17 major fires burning in Southern California, the Office of Emergency Services spends between 35 and 40 million a year, just in California on an average year. Now, if you look at major fire events, like Yellowstone, 150 to 200 million dollars was spent over four months trying to manage and mitigate that problem. If you look at the money we've spent on particular fires in California, they are definately in the millions. If you start adding up the damage: the Oakland hills fire was in the billion to two billion dollar range.*

If we had the ability I think RPAs will bring us to monitor those areas during those days, we could stop those fires short. And that is the key to not managing larger fires. Knowing where they are, detecting quickly...

Disasters are important. California is probably not that unique. We may be unique in that we have multiple types of disasters, but if you look at Florida and any of the coastal areas, they may not have earthquakes, but they have the same type of problems that we do with flooding, major mudslides, certainly fires. These all can be brought to bear with RPA's...

VI. WRAP-UP

VO: The ERAST Alliance RPA's are beginning to make the skies their home. Its a good thing, because they have important work to do. In atmospheric testing, missions for RPA's are pressing.

BARRIOLLEAUX: *NASA has been tasked by Congress to provide an environmental assessment of the next generation of supersonic transports that the aircraft and engine companies are just now trying to put some preliminary design down. To me, that seems like a fairly important thing to do. I'd love to be able to get in a mach 2.3 airplane and fly to Japan in half or a third the time it takes now. But I don't know that I want to mess up the ozone layer while I do that. So rather than spend billions of dolars and then discover that its a problem, let's be proactive rather than reactive.*

VO: RPA's are an invaluable tool for reaching the stratosphere and relaying findings to scientists. Whereas in the past, we have had to rely on manned flights, which were often constrained to six flight hours to protect the pilot, RPA's, with their ability to fly at altitude for days at a time, provide a new dimension in scientific study of the atmosphere.

And, beyond science, here's a tool for commerce. A new platform for telecommunications, for agriculture, a means to view the earth's surface with a high degree of resolution not possible from satellites. And beyond commerce, a tool for protecting lives, and property, and land from the threats of hazards, such as fire. The ERAST Alliance remotely piloted airplanes are well underway.

ATTACHMENT 6

improved means for determining potential liabilities stemming from radically changing weather conditions. In pursuing the industry's concerns, receptivity toward a role for high altitude UAVs was identified by Dick Wagaman (AUVS). Consequently, a collection of Alliance parties convened to further investigate the value and feasibility of a functional relationship between the ERAST Alliance and the insurance industry. The parties consist mainly of Dick Wagaman, Dale Tietz (acting on behalf of the ERAST Alliance generally), and Karen Robbins (AmTech). Kevin Robinson of General Research Corporation was engaged by the Alliance to provide research and expertise on insurance related requirements in scientific data collection and to exploit advanced modeling and simulation capabilities to support the task.

The ERAST group met several times in 1996 with the leading scientific advisor for the insurance industry, who had expressed considerable interest in working with the ERAST Alliance to explore possible missions in the field of cyclogenesis (cyclone storm formation). Further, at the behest of this same advisor, the ERAST group also met with the country's foremost expert on cyclogenesis, and gained his commitment to explore possible missions for high altitude UAVs.

Based on input from these advisors, as well as their interactions with the ERAST Group and other ERAST members (such as sensor lead Steve Wegener and earth scientist Jim Brass (both of NASA ARC), discussion is developing in regard to a specific possible campaign. Due to the importance of understanding storm behavior--hurricane damage represents a major economic threat to the United States and is of vital concern to the insurance industry and all levels of government--a mission focused on hurricane formation is under discussion. The mission, as currently outlined, would involve UAV flights in the area of Cape Verde, the location where hurricanes threatening the U.S. eastern seaboard have their inception. Careful consideration of the merits of a mission and its feasibility is presently underway. As a part of validating this interaction with the insurance industry, there are tentative plans for the ERAST Alliance to sponsor a follow-on, comprehensive meeting with key industry representatives (no date has been set).

The ERAST group has also offered to explore the value of other possible missions and to interact with prospective UAV end-users as the possibilities emerge. Consequently, Dale Tietz has undertaken to review a possible earth mapping mission which would involve UAV flight from Greenland, and is proceeding in coordination with NASA Goddard's ice mapping mission.

The objective of the ERAST group is to study the value of particular missions to the ERAST Alliance as an opportunity for demonstrating technology performance and applications, to identify the benefits to end-users and

ERAST
COMMERCIALIZATION ACTIVITIES

Summary

Overview

A goal of the ERAST Program is the commercial application of technology resulting from the work of the ERAST Alliance. This goal is sufficiently primary to be called out in the recitals section of the ERAST Joint Sponsored Research Agreement. In support of this goal, two activities described below were commenced in 1996 to assess and explore commercial applications of UAV technologies relevant to the ERAST Alliance.

I. Assessment of UAV Commercialization Opportunities

To date, much of the business literature that addresses potential commercial uses for UAVs has suggested the value of low to mid range altitude UAVs, (i.e., up to 50,000 feet). Since ERAST is unquestionably dedicated to high altitude UAV development, there is a specific need to address the potential uses of higher flying UAVs. The ERAST Alliance commenced a study focused on non-defense applications of high altitude UAVs in the latter part of 1996. The study is led by Longitude 122 West, and performed principally by that company's President and a subcontractor, Basil Papadales, an acknowledged expert in UAVs. Basil is a key study team member as he has extensive interaction with industry seeking commercial UAV applications.

The study will address potential UAV functions and end-users, as well as reveal how UAVs may be positioned to perform potential functions relative to other competing systems. The study will also recommend particular functions best suited to the type of aircraft being developed by the ERAST Alliance, and will delineate specific aircraft design guidelines required to perform designated functions.

The study is expected to be completed by Spring of 1997.

II. Exploration of Technology Application Areas

In addition to the assessment of potential functional areas for higher altitude UAVs, the ERAST Alliance also sought to explore particular missions where end-users expressed interest in high altitude UAV capabilities. It was learned in late 1996 that segments of the insurance industry were searching for

cultivate their interest, if appropriate, and assess the feasibility of the mission(s).

All activities of the ERAST group are being coordinated with Longitude 122 West, and reported to the ERAST Project Manager, Jenny Baer-Riedhart. A full report to the members of the ERAST Alliance will be provided at the first 1997 ERAST Alliance business meeting.