

# Attracting and retaining human talent in high-tech and innovation

Case study of the CTAE Aerospace Research and Technology Centre

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## Abstract

Statistics in most western countries show a decreasing interest among young people to make a career of scientific or technical nature. This paper describes how high-tech researchers and engineers from local and international communities are attracted to and retained in aerospace R&D, using the example of CTAE, a start-up research and technology centre located near Barcelona, Spain.

Using the Centre's strategic plan as a baseline, the human resource approach is one of a permanent outreach and promotion to attract young talented people, in close collaboration with universities and other key partners and customers. Networks, on-line tools, student internships, professional events, etc. are some of the tools described. In part, they benefit from the leverage effect of the region's vibrant economy and quality of life.

Career management, performance evaluation and incentives are also described. An emphasis is put on maintaining a motivating working atmosphere by encouraging creativity, innovation and team work while respecting the necessary confidentiality of project work and the intellectual property requirements.

## Resumen: El talento humano en tecnología e innovación: cómo atraerlo y retenerlo.

En muchos países occidentales, las estadísticas muestran un interés decreciente de los jóvenes por las carreras científicas y técnicas. Usando el ejemplo del CTAE, un centro tecnológico de reciente creación en las inmediaciones de Barcelona, el presente artículo describe una estrategia utilizada para atraer a investigadores y tecnólogos, tanto locales como de otras regiones, para trabajar en I+D aeroespacial. También se explican las técnicas usadas por el Centro para retener a su talento humano y mantener la motivación por el trabajo.

Tomando como base el Plan estratégico del Centro, se presenta el proceso de selección de personal, llevado a cabo en estrecha colaboración con universidades y otros socios y clientes del Centro. Entre otros, se describe la preparación del plan estratégico del Centro y su comunicación y divulgación, así como las técnicas de atracción de candidatos mediante redes de contactos y herramientas en línea, estudiantes becarios, eventos profesionales, así como el efecto de atracción que genera el dinamismo de la economía y la calidad de vida de la región.

También se presenta la gestión de los recursos humanos: técnicas de gestión de la carrera profesional, de evaluación del trabajo e incentivos. Se pone énfasis en mantener la motivación en el trabajo incentivando la creatividad, la innovación y el trabajo en equipo, al mismo tiempo que se respetan los requisitos de confidencialidad de los proyectos y de propiedad intelectual.

## Resum: El talent humà en tecnologia i innovació: com atraure'l i retenir-lo.

En molts països occidentals, les estadístiques mostren un interès minvant dels joves per a les carreres científiques i tècniques. Utilitzant com exemple el CTAE, un centre tecnològic de recent creació prop de Barcelona, el present article descriu una estratègia utilitzada per a atraure i retenir investigadors i tecnòlegs, tant locals com d'altres regions, per a treballar en R+D aeroespacial.

Prenent com a base el Pla estratègic del centre, la gestió dels recursos humans inclou una promoció i divulgació permanents per a atraure el talent d'investigadors, en estreta col·laboració amb universitats i clients: xarxes de contactes, eines en línia, estudiants becaris, etc, es veuen complementats per l'atractiu que suposen el dinamisme de la economia i la qualitat de vida de la regió.

També es presenten tècniques utilitzades pel centre en la gestió de la carrera professional, la avaluació dels resultats i els incentius. Finalment, es posa èmfasi en mantenir un ambient motivat de treball través del foment de la creativitat, la innovació i el treball en equip, al mateix temps que es respecten els requeriments de confidencialitat dels projectes i de propietat intel·lectual.

## Strategic plan: helping industry with talented international researchers

### Providing industry with technical expertise and test platforms:

CTAE was set up in 2005 by industry, government and academia of the region of Catalonia, with a mission to promote innovation and reinforce industrial competitiveness through the research and development of new aerospace technologies as well as their transfer to and from other sectors of the economy. The Centre operates as a non profit foundation with public and private funding, and focuses its work on providing industry with technical expertise and test platforms in the areas of:

- R&D in aerospace applications to enhance the citizen's quality of life (the environment, security, mobility, infrastructure management, etc). Integration of technologies such as satellite, airborne and ground-based telecommunications, navigation and positioning, and remote sensing.
- Robotics, advanced automation and safety-critical software for aeronautics and space, including unmanned aerial vehicles.
- Aircraft interiors and life support systems for human spaceflight and space tourism.

The top decision-making body is the Centre's Board of Trustees, where the majority of voting seats is held by companies, besides university and government.

In just over two years, the Centre has initiated more than 30 projects and reached a funding level of 35% through contracted R&D, the remaining 65% coming from public grants, most of them of competitive nature. The Centre's commercial clients include small, medium and large companies in Spain. In 2007, the total budget was close to 1.2 million Euros.

The Centre's Strategic Plan defines the principles in building and maintaining its human resources:

- Recruitment of recognised researchers and engineers according to the R&D needs, in close coordination with the Centre's partners and main customers.
- Encouragement of staff transfer to industry, including to start-up companies.
- Close cooperation with industry for the establishment of integrated project teams, and with universities for the participation of student interns, PhD candidates and senior researchers in CTAE's projects.
- Incentives scheme to recognise and motivate each individual's performance, and to foster creativity through interdisciplinary team work.



Employees of CTAE and of the start-up companies of its incubator met in October 2007 with members of the Board of Trustees on the Centre's new premises in Viladecans, for the opening of a public exhibition.

The Plan also foresees the participation of staff in integrated teams with industry, as well as the incubation of start-up technology-based companies on the Centre's premises.

Building a multidisciplinary team in less than three years:

- The current 18 staff members represent 7 nationalities and cover a variety of disciplines which include R&D management, business administration, aerospace engineering, computer science and information technologies, telecommunications, physics, robotics, electronics, industrial engineering, and aerospace and telecommunications law. All but two of the Centre's staff members have a higher university degree, and one has a PhD. The remaining two employees are studying part-time at local universities. All of the Centre's staff biographies are online at [www.ctae.org/about/CTAE/staff](http://www.ctae.org/about/CTAE/staff)
- 3 staff members are working part-time on their PhD theses in the areas of aeronautics, robotics and advanced concepts in telecommunications.
- 5 employees are integrated in different CTAE-industry project teams, located on customers' premises.
- As many as 12 students from 6 countries have performed an internship at the Centre in the past two years. Two of them wrote their final project for a degree in telecommunications engineering, and both obtained excellent marks (one with honours) from the Technical University of Catalonia (UPC). The latter was recruited upon graduation as full-time junior researcher at the Centre.
- 2 start-up companies are operating out of CTAE's small business incubator, with a very promising cooperation with the Centre in several R&D projects.



Gathering of staff, partners and friends at a farewell breakfast in April 2007, when CTAE moved its offices from the *Mediterranean Technology Park* in Castelldefels to a larger facility at the nearby *Aerospace and Mobility Park* of Viladecans.

**Identifying and attracting talented candidates: a long-term investment**

One of the Centre's missions being the contribution to the training of specialists, and thanks to its public-private nature, CTAE can dedicate some resources to encourage talented young people to enrol in aerospace studies, to acquire a first professional experience in an area of interest to industry, or to register in specialised training programmes.

Why don't you enrol in aerospace studies? - Addressing high school students:

Aeronautics and space have always fascinated young people, but many are shy to enrol if they feel they will not be up to the required level, or will not find a job locally. Through different activities such as seminars, public conferences and its web page, CTAE has helped spread the word in the local community about a growing aerospace activity and the possibility of finding a job without having to move abroad on a permanent basis.

Since the creation in 1995 of the Institute of Space Studies of Catalonia (IEEC), a cluster of scientific groups from four different organisations, followed in 2000 by the foundation of the Barcelona Aeronautics and Space Association (BAIE), and by the subsequent new aerospace engineering degrees set up by several universities in Catalonia, a number of good students have been attracted and have been an invaluable source of interns to CTAE.

CTAE contributes to motivating high-school students to choose aerospace through its cooperation in educational projects run by institutions such as the City of Barcelona (Office for Aerospace Promotion, Education Institute, and Foundation for Vocational Training), the Spanish National Institute for Aerospace Technology (INTA) or the Community of Ariane Cities (CVA).

In some cases, the Centre is approached directly by high-school teachers or students and, to the extent of its modest capabilities, provides guidance, supervises projects and even grants small scholarships to promising students.

#### How can I work in aerospace after my studies? - Addressing vocational and university students:

Here the Centre follows a more proactive approach in many fronts, to reach promising university students and young graduates. The international experience of CTAE's management has made it easier to recruit excellent candidates for each job, and has allowed the centre to enter, in less than three years of activity, into active collaboration with over 20 research institutes and centres, half of which are outside of Spain. The following are some of the initiatives used to identify and to recruit motivated young professionals:

- Active collaboration with student associations and with international networks of students and young graduates, such as AESS Estudiants, CVA, International Space University (ISU) or Euroavia, the European association of aerospace engineering students. Most of these efforts make extensive use of online tools, such as employment databases, electronic news lists, blogs, etc.
- Organisation of information sessions on training opportunities and workshops on aerospace topics, in cooperation with government agencies, universities and research institutes such as the Government of the Generalitat of Catalonia, the City of Barcelona, IEEC, ISU or UPC.
- Providing university students and young graduates with career guidance, opportunities for internships abroad and contacts with industry. In some cases, the Centre grants scholarships to promising students enrolled in local universities, such as UPC's new *Master of Aerospace Science and Technology*, started in 2007. In one case, the Centre has granted a scholarship to a promising student for his internship at the Massachusetts Institute of Technology (MIT), where he will carry out research in formation flying and collaborative robotics.
- Funding of student fees to participate in professional meetings, congresses and symposia. On a regular basis, CTAE is part of local bidding committees to bring to Barcelona the celebration of international aerospace events, and contributes to their organisation. For example, the 7<sup>th</sup> *CNES-DLR International Symposium on Launcher Technologies*, and the *EURISY Symposium on Space applications for local and regional authorities* were held in Barcelona in April and May of 2007, respectively.
- Providing internships to promising students, and involving them in real projects. As many as 12 students from 6 countries and 5 universities have performed an internship at the Centre in the past two years. Several internships have been extended beyond the initial period, and one has led to a full-time contract at the Centre.
- Launching new initiatives for hands-on and university-industry collaboration. One of CTAE's student interns has proposed the organisation of a student contest of indoor unmanned aerial vehicles. This initiative is being studied for implementation with mixed teams of vocational school and engineering students, and has received preliminary interest from potential industrial sponsors.

In many cases, thanks to its network of contacts with universities and with individual graduates, CTAE is able to match offer and demand by putting in contact valuable candidates with employers who approach the Centre looking for candidates they cannot find elsewhere.



Participants from government, space agencies, academia and industry at the meeting of CTAE's Advisory Board on Satellite Navigation Applications, hosted by the Centre for Innovation and Enterprise Development (CIDEM) of the Government of the Generalitat of Catalonia in Barcelona, on 26 November 2006.

### Barcelona is the place where I'd like to work, can you help me?:

An increasing number of aerospace professionals are now looking for job opportunities in Catalonia, attracted by its vibrant economy and recognised quality of life, as well as by the perception that new opportunities are arising in the aerospace field. This population fits mainly with the following profiles:

- Engineers and scientists trained in Catalan universities who had to look for jobs in other regions of Spain or abroad, and have now a very valuable international experience in telecommunications, remote sensing, navigation, etc.
- Young graduates from local universities in aeronautics and industrial engineering, physics, medical and life sciences, management and law.
- Professionals from other regions and countries, attracted by the opportunity to work in their field and settle in a Mediterranean country with many attractive features.

Due to its recent creation and its image of a dynamic and motivating organisation, CTAE is attracting a significant number of applications from professionals all over the world, often with impressive CVs. Obviously not all applications have a direct fit at the Centre, but in several cases CTAE has been able to direct the candidate to interested employers in Spain.

In addition to the organisation of professional events described in the preceding sections, the following examples have proven to be very useful to match workforce offer and demand:

- Short courses. An interesting example is CTAE's initiative of a one-week professional development course on *Quality Assurance in Critical Software and Systems - Focus on Transport and Aerospace Applications*, offered already twice in 2007 in collaboration with UPC Foundation, Ohio University and a number of local software companies. The course has attracted participants from China's Manned Space Engineering Office, and has helped to set up professional relations among participating companies who had never met before.
- Technology brokerage events. In each of the Centre's areas of research, brokerage events are organised to bring technology offer and demand together, and to contribute to the development of collaborative clusters. Some examples are:
  - Brokerage event on aircraft interiors and on-board entertainment, offered in November of 2006 which gathered over 30 companies and research groups.
  - Brokerage event on Satellite Navigation applications, offered in February of 2007 as part of the GlobalGEO and Geomatics Week conferences.

## Maintaining staff motivation in a growing organisation

In the first years of operation, it has been relatively easy to build and maintain an atmosphere of creativity and motivation, due mainly to the small size of the team (below 20 staff), to the young average age (below 30 years), and to the variety of R&D projects carried out. The challenge is to maintain this mood in the coming years with a growing organisation, while maintaining customer satisfaction in terms of quality assurance, confidentiality, costing and delivery deadlines, etc.

Some of the features that have characterised the work environment so far include:

- Formal support from recognized organizations. Any professional wants to be sure that his/her organisation will provide job security and growth opportunities. In the early years of the Centre, this “peace of mind” has come from the founding members, which include the Government of the Generalitat of Catalonia, the Technical University of Catalonia (UPC), the Barcelona Aeronautics and Space Association (BAIE), as well as some of the leading aerospace companies in the region. Crucial support has also come from the Spanish Ministry of Industry (through CDTI) and from the European Space Agency (ESA).
- Creativity and multidisciplinary work. The Centre encourages staff to make proposals for new projects, to suggest initiatives in business development, and to submit ideas for the improvement of internal processes. In some cases, student interns have made excellent proposals, some of which are already being implemented. Whenever possible, each staff member has to acquire some experience in project management by progressively taking planning and coordination responsibilities. In addition to following the applicable quality assurance requirements, the author of a deliverable produced at the Centre (test result, proposal or presentation) is requested to seek the proof reading by at least one colleague not directly related with the project, provided the intellectual property framework of the project permits such share of knowledge.
- Personal research and training. Employees pursuing a PhD or a university degree in one of the Centre’s areas of interest can benefit from a certain percentage of working time for study and research. Enrolment in short courses and registration to specialised conferences and symposia is encouraged, and limited financial support is available. Registrations are agreed with the employee’s supervisor on a case by case basis. On the other hand, feedback, review, constructive criticism of documents is likely to be less effective since there may be an assumption in general that *“someone else will know if this is correct”*.
- The use of languages: English is a must. The Centre’s document tree in its Intranet is in English only, and all internal documents are written in English. Whenever possible, deliverables to third parties are done in English, but this is obviously not always possible. The knowledge of the local official languages, Spanish and Catalan, is not a requirement for recruitment, but all international colleagues naturally learn one or both local languages on a voluntary basis. Meetings can be held in any of the three languages, but English is the common language to everyone.

No solution is perfect, and this overwhelming use of English also has some drawbacks. As one native English speaking staff member has put it: *“Some staff who are less confident may find it harder to contribute to discussions or meetings verbally, and spend time delivering their view in written form perhaps when less relevant - or worse, don’t contribute their idea at all.”*

On the other hand, the approach of keeping documents and meetings in English, has made learning Spanish/Catalan a much slower process for international staff members than it might have been otherwise. As an incentive to encourage international colleagues to learn the local languages, the Centre covers the expenses when a paper is presented in Spanish or Catalan in a conference. For instance, international staff will present several papers at an upcoming conference of the *Association of Engineers of Catalan Language*, planned for the end of 2008 in Majorca.

- Benefiting from incentives to recruit PhDs. The Centre’s first PhD joined in April of 2007 and was awarded the prestigious *ICREA junior empresa* grant. He has recently been promoted to the position of Head of R&D and Quality Management, overseeing all of the Centre’s research projects. Another engineer has benefited from a grant to encourage the recruitment of PhD students. These grants are of great help to allow some staff members

to spend a percentage of their time in a field of research which does not yet have an immediate application in the market and therefore has no paying customer.

- Attractive salary package. Despite the limited resources of a start-up centre, CTAE makes an effort to provide the best salary and benefits package possible. This includes the Centre's affiliation to the Spanish Universities and Research labour convention, one of the most attractive ones in terms of work time flexibility to perform personal research, and length of yearly leave. Gross salary is slightly above the average in comparable jobs, and compensation for the increase in cost of living is done systematically as soon as official statistics are published. According to individual working needs, additional benefits are granted in the form of meal and transportation tickets, and travel to professional meetings.
- Management structure and operations.
  - The hierarchical structure is intentionally left as loose as possible, with a high trust put by the management staff in the commitment and responsibility of each employee. Monitoring of action items and their deadlines is done in a collaborative way, using online tools in the Intranet.
  - Heads of Unit meet every 10 days in Management Meetings, where recurrent agenda items include: resources and deadlines for proposal and project deliveries; preparation of decisions by the Board; incoming and departing staff and interns; upcoming events and VIP visits. Management Meetings are scheduled on the Centre's shared calendar in the Intranet, and are open to all permanent staff members. Interns are sometimes invited to participate in Management Meetings as a learning experience. Any staff member can propose to include an item in the agenda.
- Performance evaluation and incentives. Due to the small size of the team, the evaluation of staff performance is done in a continuous and informal way. In addition, a formal yearly performance evaluation is carried out for each staff member by one or two supervisors. A detailed document is signed, listing the objectives fulfilled as well as the prospects for the next 12 months in performance, objectives, training, promotion, etc.

One internal proposal has led to the implementation, on a voluntary basis, of peer evaluation, where any employee can collect comments from colleagues on his/her performance and can use them as inputs for the formal evaluation process.

A draft incentives scheme has been circulated to staff for comments, consisting in monetary compensation to individuals or teams who have excelled during the year in achieving objectives such as:

- the most innovative technical solution to a given challenge;
  - the best service given to make (or keep) a customer happy;
  - the best proposal or implementation of a university-industry collaboration;
  - the largest R&D contract obtained;
  - the best proposal (and/or implementation) for the improvement of an internal process in administration, or in project quality;
  - the most effective outreach/marketing/publicity operation proposed and/or implemented (including presentation at a conference);
  - the best accomplishment of the professional objectives set in the yearly staff performance review.
- Social activities. On a regular basis, social gatherings are organised with a modest budget to celebrate a new staff arrival, an anniversary or a special event such as the Chinese New Year. Some of these gatherings are initiated by the Centre's management, but often are the spontaneous initiative of a group of staff members, and are of course open to everyone. So far, company outings have featured a beach ball and a paintball game, and a visit to a technical museum.

## Conclusion

It is hoped that some of the techniques described here will inspire policy and decision makers in government and academia to increase the motivation of young people to make a career in science or technology.

Through the example of a start-up research and technology centre, this paper has illustrated some techniques used in successfully attracting and retaining talented staff members in high-tech and innovation, as well as some of the challenges ahead in a larger, more compartmentalised organisation.

The driving principles in this approach are:

- Permanent investment in motivating young people to choose a career in aerospace, and in reaching talented researchers and engineers worldwide;
  - Applying an open, transparent management approach that encourages multidisciplinary team work and creativity, as well as healthy competition.
  - Fostering, through integrated project teams, the transfer of knowledge and people from University to the Technology Centre, and from the Centre to Industry.
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Membre de:

