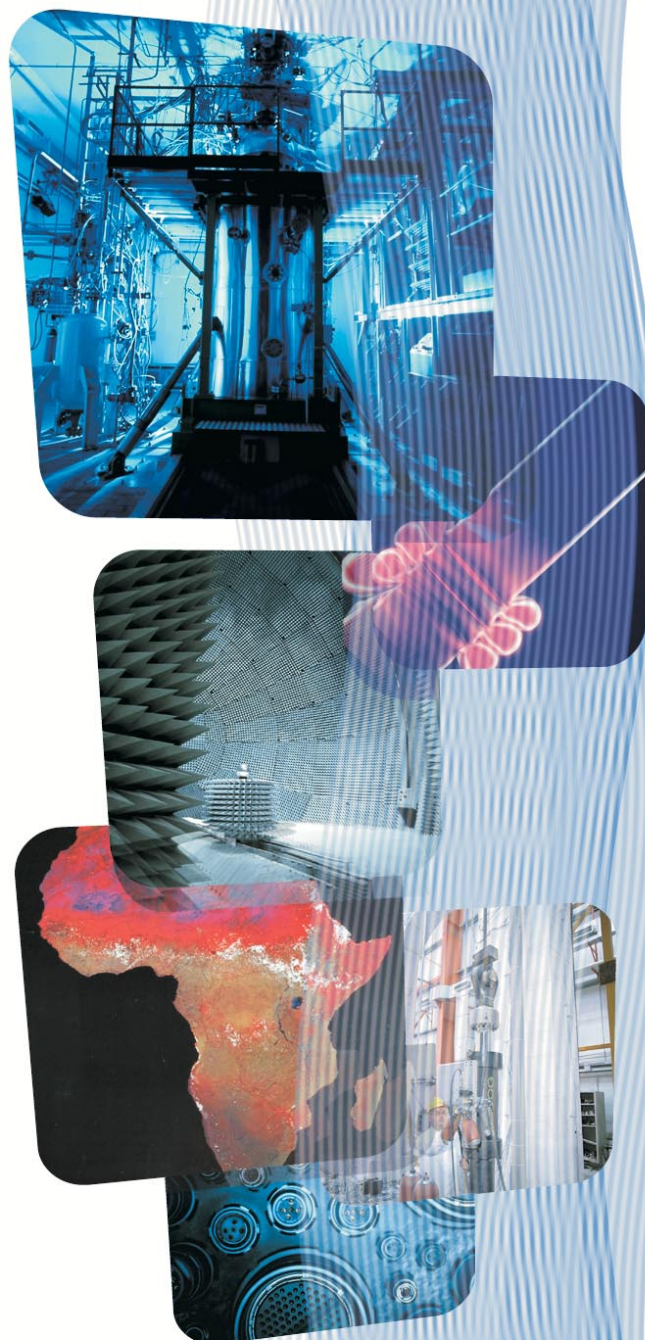


ipsc

**INSTITUTE FOR
THE PROTECTION AND
SECURITY OF
THE CITIZEN**



**ACTIVITY REPORT
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EUROPEAN COMMISSION
JOINT RESEARCH CENTRE

Report EUR xxxxx EN



European Commission

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Institute for the Protection and Security of the Citizen
Activity Report 2002



EUROPEAN COMMISSION
JOINT RESEARCH CENTRE

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FOREWORD



Jean-Marie Cadiou
Director of IPSC

The last year of the 5th Framework programme was both a year of stabilization and a year of change for the Institute for the Protection and Security of the Citizen. Its workprogramme and development of core competencies were strengthened in close collaboration with its customers. The European and international developments urge the institute to adapt its skills to new situations and challenges. In an effort to also foster integration within the JRC, the re-assignment/rotation of director posts within the JRC allowed me to take up duty at IPSC on November 1st 2002.

During the preparation for the 6th Framework Programme, significant integration efforts resulted in the elaboration of the IPSC core competencies according to the targeted customer groups:

1. Developments for enhancing nuclear safeguards and non-proliferation
2. Technologies for effective compliance monitoring of EU regulations and fighting anti-fraud
3. Technologies for increasing efficiency of humanitarian aid and assistance
4. Technologies for responding to cybersecurity threats and for systematic web intelligence gathering
5. Assessment and management of natural and technological risks
6. Applied statistics and knowledge assessment for the economy and agriculture

The merging of competencies from the space applications and systems, informatics and safety areas is strengthening IPSC activities and allows the provision of research-based, systems-oriented support to EU policies aiming at protecting the citizen against economic and technological risk. The vulnerability aspects of engineered, informatics, economical or natural systems are key concerns of EU policy makers. IPSC tries to address these concerns e.g. by providing innovative ways of observing them, by bringing together pieces of information previously non-correlated or by modelling and systematic analysis of the systems' behaviour. Of prime importance is the European and international collaboration both with individual member states (e.g. their national civil protection department) and in networks with R&D partners (e.g. in the frame of the EU indirect actions).

The enlargement of the European Union encourages us to include the needs and specificity of the candidate countries into these competencies. Key examples are the agriculture, technological risks and safeguards sectors. Also in the other areas dedicated efforts are ongoing to expand the collaboration to the Europe 25+.

The international developments of the last one and a half years, paying increased attention to security issues in a wide variety of fields, encourages IPSC to seek to expand its activity range in this direction. Direct requests from our customer DGs in this area are treated with high importance and close relations with the European Council are established through DG RELEX (e.g. with the Political Military Group). This causes also some of the work to move in the direction of dual-use technologies and/or police/special services related activities, which obviously opens up new challenges.

It is my intention in the course of this year to further exploit these opportunities and challenges and I know I can count on the Institute's dedicated staff to continue their excellent work in order to achieve these goals.

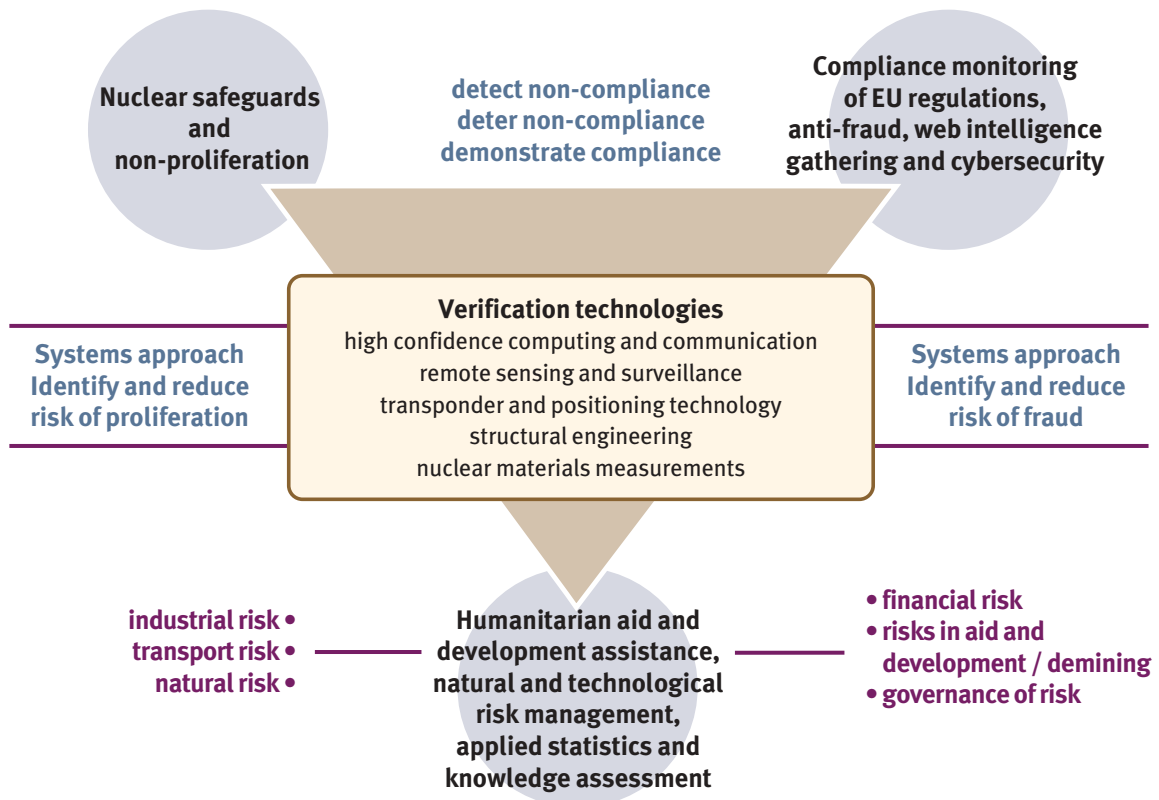
MISSION STATEMENT

IPSC provides research-based, systems-oriented support to EU policies so as to protect the citizen against economic and technological risk. The Institute maintains and develops its expertise and networks in information, communication, space and engineering technology in support of its mission. The strong cross-fertilisation between its nuclear and non-nuclear activities strengthens the expertise it can bring to the benefit of customers in both domains.

OVERVIEW

In a Europe with a liberalised economy and open borders, responsibility for regulations and measures to ensure sustainable development is shifting to a European level. The Institute for the Protection and Security of the Citizen (IPSC) focuses on supporting EU policy on six aspects of sustainable development where there is an economic or technological risk to individuals. These aspects are (1) developments for enhancing nuclear safeguards and non-proliferation; (2) technologies for effective compliance monitoring of EU regulations and fighting fraud; (3) technologies for increasing efficiency of humanitarian aid and development assistance; (4) technologies for responding to cybersecurity threats

and for systematic web intelligence gathering; (5) assessment and management of natural and technological risks; (6) applied statistics and knowledge assessment for the economy and agriculture. IPSC expertise covers a broad range of skills in systems analysis, information and communication technologies as well as specific expertise in the measurement technologies of verification and monitoring. It aims to further develop its identity as a low-inertia, high value-added body that is able to work together with the wider scientific community and responsible international organizations to provide solutions appropriate to the needs of its customers.



ORGANISATIONAL STRUCTURE



Jean-Marie Cadiou

Director



James Gray

Management
Support



Martyn Dowell

Cybersecurity and
New Technologies
for Combating Fraud



Jacques Delincé

Monitoring
Agriculture with
Remote Sensing



Alfredo C. Lucia

Technological and
Economic Risk
Management



Michel Gérardin

European Laboratory for
Structural Assessment



Alois Sieber

Humanitarian
Security



André Poucet

Non-Proliferation and
Nuclear Safeguards

UNIT DESCRIPTIONS

Management Support

The Unit provides a focus of administrative competence for budgetary, financial, contractual, personnel, information technology and infrastructure matters and concentrates the Institute's training, communications and strategy, health and safety, and total quality management support activities.

Cybersecurity and New Technologies for Combating Fraud

The Unit supports EU efforts to protect citizens from risks associated with cybercrime, privacy and Internet vulnerabilities. The Unit also supports EU efforts to harness new technologies for the monitoring of compliance to EU regulations and for the detection and prevention of fraud.

Monitoring Agriculture with Remote Sensing (MARS)

The Unit's activities include anti-fraud measures related to implementation of the Common Agricultural Policy; crop yield monitoring using both remote sensing and ground surveys; specific surveys for definition or reform of agricultural policies; and new sensors and methods.

Technological and Economic Risk Management

The Unit's activities include: risk management for natural/technological hazards; managing emergency situations; using statistics and computer science to fight fraud; strategic decision making; and official statistics, econometrics and policy performance indicators.

European Laboratory for Structural Assessment (ELSA)

The Unit studies safety implications of hazards on structures such as buildings, bridges, transport and cultural heritage. Unique facilities include the Reaction Wall for large-scale structural tests and the Large Dynamic Test Facility (LDTF) for crash tests.

Humanitarian Security

The unit provides an independent technical reference, offering measurement resources for validation of methods and data in applications related to civilian demining, natural hazards, coastal monitoring and management, and electromagnetic threats.

Non-Proliferation and Nuclear Safeguards

The Unit provides research, technology, instruments, technical services and training for verification of treaties related to non-proliferation of weapons of mass destruction. It also applies expertise to the fight against livestock and food product fraud.

CORE COMPETENCIES

Technologies for increasing the efficiency of humanitarian aid and development assistance

Technologies for effective compliance monitoring of EU regs. and fighting fraud

Developments for enhancing nuclear safeguards and non-proliferation

IPSC Units

Core Competencies

Cybersecurity and New Technologies for Combating Fraud	applied information, communication and space technologies		core	core	core		contributes
Monitoring Agriculture with Remote Sensing	analysis of remote sensing imagery and geographical information		core	core			core
Technological and Economical Risk Management	risk analysis, risk management and statistics		contributes			core	core
European Laboratory for Structural Assessment	development of numerical and experimental methods for assessing the vulnerability and safety of structures					core	
Humanitarian Security	electromagnetic sensor technologies; signal processing and modelling; test and evaluation		contributes	core			
Non-Proliferation and Nuclear Safeguards	nuclear measurement methods and instruments; sealing and transponder technologies; surveillance and secure communications; high precision volume measurement methods	core	contributes				

Technologies for responding to cybersecurity threats and for systematic web intelligence gathering

Assessment and management of natural and technological risks

Applied statistics and knowledge assessment for the economy and agriculture

SCIENTIFIC OBJECTIVES 2003

1	<p><i>Widen scope of compliance monitoring and anti-fraud measures</i></p> <p>Indicator: Efforts to improve the management of regional funds will include supporting the modernization of cadastres. Projects in livestock and fisheries monitoring will make increasing use of DNA identification technologies.</p>
2	<p><i>Consolidate work in Cybersecurity</i></p> <p>Indicator: Integrate work on cybersecurity with that of Institute for Prospective Technological Studies (Seville) to provide a better interface with customers and partners. Measures will include common studies on specific topics with a special emphasis in supporting the implementation of the EU regulatory framework in data protection and privacy.</p>
3	<p><i>Understand vulnerability from emerging threats</i></p> <p>Indicator: Assess vulnerability to emerging threats and the adequacy of present monitoring systems and propose a way forward to Commission services. The threats to be considered will include attacks on Europe's information infrastructure, cybercrime, the proliferation of weapons of mass destruction and the trafficking of illicit goods through Europe's external borders.</p>
4	<p><i>Assess technological risk on a European scale</i></p> <p>Indicator: Support better risk assessment in environmental policy by working together with Institute for Energy (Petten) and partners in Member States to develop common European measures of risk for certain accidental events in industrial plants.</p>
5	<p><i>Explore increasing involvement in ecological and envirogenomic issues</i></p> <p>Indicator: Explore how to apply its systems, statistical and information technology expertise to environmental and ecological systems – particularly in providing scientific advice on fisheries management issues and on developing a European capability in envirogenomics.</p>
6	<p><i>Develop a strategy for the European Laboratory for Structural Assessment</i></p> <p>Indicator: Propose a strategy for ELSA based on customer DGs' priorities and including an assessment of the needs for improved standards in building safety, the added-value of the reaction wall facility in developing these standards and the benefits to the research community of a visible focus for European structural safety efforts and a training centre for European researchers.</p>
7	<p><i>Move forward on GMES</i></p> <p>Indicator: Provide support to the steering committee of the Global Monitoring for Environment and Security (GMES) initiative by contributing to the design of the overall architecture and by integrating its ongoing institutional applications of earth observation by satellites into wider efforts involving industry, academia and research centres and thus creating a foundation stone for the security dimension.</p>
8	<p><i>Contribute to the European Research Area</i></p> <p><i>Mainly through participation in networks but also through participation in joint projects and through hosting European researchers in its laboratories. In order to enhance interaction with European universities and with laboratories in the Member States, subject to the availability of sufficient staff credits, the sum of grant-holders, visiting scientists and seconded national experts working in IPSC at the end of 2003 will be greater than in 2002</i></p> <p>Indicator: Number of networks, integrated projects, trainees, use of large facilities by external users.</p>
9	<p><i>Support the Enlargement Process</i></p> <p><i>Special efforts will be devoted to involving researchers from enlargement countries in IPSC activities. Projects oriented towards the needs of these countries will continue with priority given to those supporting their implementation of the "acquis communautaire"</i></p> <p>Indicator: Number of workshops, number of visiting scientists and detached national experts, participation in collaborations.</p>
10	<p><i>Encourage scientific innovation</i></p> <p>Indicator: IPSC will encourage scientific innovation by giving the Institute's researchers the opportunity to propose exploratory research projects and by funding those deemed by the scientific committee and external evaluators to be the most innovative and most strategic.</p>

CUSTOMERS

Technologies for increasing the efficiency of humanitarian aid and development assistance

Technologies for effective compliance monitoring of EU regs. and fighting fraud

Developments for enhancing nuclear safeguards and non-proliferation

Agriculture DG		•	•			•
Economic and Financial Affairs DG						•
Employment and Social Affairs DG						•
Energy and Transport DG	•				•	
Enlargement DG	•	•	•	•	•	•
Enterprise DG				•	•	•
Environment DG		•			•	•
EuropeAid Cooperation Office (AIDCO)		•	•			
European Antifraud Office (OLAF)		•				
European Humanitarian Office (ECHO)			•			
European Investment Bank (EIB)						•
EUROSTAT		•				•
External Relations DG	•	•	•		•	
Fisheries DG		•				
Health and Consumer Protection DG		•		•		
Information Society DG		•		•		
Internal Market DG		•				•
International Atomic Energy Agency (IAEA)	•					
Justice and Home Affairs DG				•		
Press and Communication DG				•		
Regional Policy DG		•			•	
Research DG				•		•

Technologies for responding to cybersecurity threats and for systematic web intelligence gathering

Assessment and management of natural and technological risks

Applied statistics and knowledge assessment for the economy and agriculture

IPSC HIGHLIGHTS

IPSC's scientific contribution generates real tangible results that are appreciated by decision makers, scientific collaborators, the media and the general public. A flavour of what has been achieved over the past 15 months is described below.

Invention and development of the European Media Monitor (EMM)

The JRC began to investigate methods to detect news stories as soon as they appeared on websites toward the end of 2001. At that time, the Press and Communications DG relied on manual daily news monitoring and news agency wires. This was very labour-intensive and more crucially, provided news up to a day late. In today's climate of rapid response to breaking news, the Press and Communications DG needed a faster system. Therefore, the JRC developed a method to analyse items appearing on European news websites and those of key non-government organisations. The system has proved so popular and useful to Commission officials that it has come into full operation and has been further refined. A fast and efficient text analysis system processes the full text of all new articles and classifies the content into any EC specific policy area. EMM has now been adopted by many DGs as a primary source of news and intelligence. The alert system is now an integral part of the Commission Intranet and accessed by over seven thousand Commission employees daily. The JRC EMM system is continuing to evolve and providing real time solutions to all its users' needs.

Damage analysis over Macedonia and the Jenin refugee camp

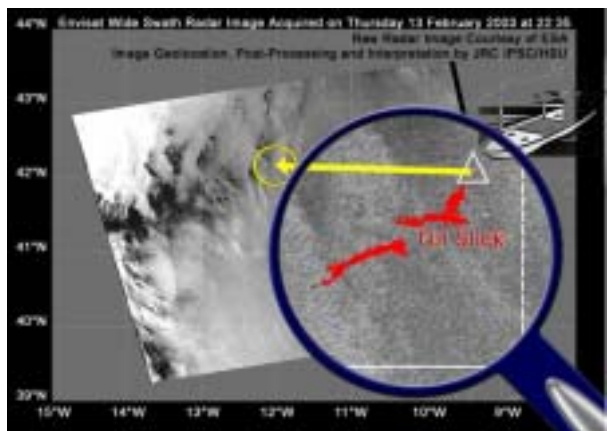
Post-crisis damage estimate maps, particularly of areas that are inaccessible to ground-based surveys, are indispensable to the Commission's EuropeAid for Co-operation Office (AIDCO) for prioritising areas for physical rehabilitation and construction.



Satellite-derived damage map of the Jenin refugee camp

Through a thorough comparison of change detection methods as well as traditional and innovative, object-oriented, image classification techniques applied to commercial 1m and 2m resolution optical satellite imagery acquired over the former Yugoslav Republic of Macedonia and the Jenin refugee camp, the JRC identified the technical boundaries for automatically discriminating and mapping post-crisis structural, urban, damage. The results showed that a reasonable estimation of damage could be obtained, using change detection methods combined with object-oriented image classification, for houses and buildings classified as severely damaged even with 2m resolution optical satellite imagery. Ongoing work is examining the use of mathematical morphological techniques and radar remote sensing for identifying post-conflict structural urban damage.

Prestige accident



Area 250 km West of the Galician Coast

The catastrophic ecological effects of massive oil spills, such as that resulting from the sinking of the tanker 'Prestige' off the northwest coast of Spain in November 2002, made headline news. Yet the cumulative effects of daily discharges – often deliberate – occurring along Europe's busy shipping lanes go largely unreported. Systematic analysis of satellite imagery by the JRC reveals the scale of the problem. The support given by the JRC in the aftermath of the Prestige accident focused on: images equalisation, geolocation, and final image interpretation in case some spills were identified. An extensive series of Envisat and ERS-2 images were analysed and interpreted for DG ENV, which distributed them as an attachment to INFOSHEET reports through the Civil Protection Mechanism. The JRC's support in the Pres-

tige accident was highlighted in a Communication from the Commission to the European Parliament and Council.

Mapping

One of the main problems of operational demining is the lack of appropriate spatial data. Mapping, which is relatively up-to-date and available at sufficient scales (such as 1:50.000 scale topographic maps), usually does not exist for most mine-affected countries, which causes major difficulties for demining operators. In order to address this problem, IPSC started a research activity to study various state-of-the-art satellite image-based spatial data production techniques. The resulting maps at scales ranging from 1:1 Mio to 1:5 K can be used for demining planning, operation execution and documentation. First prototypes were developed for selected cities of Afghanistan and were handed over by Commissioner Patten to the Afghan Prime Minister in May 2002. The maps produced by the JRC for DG RELEX were found to be invaluable for the efficient planning and execution of ongoing demining activities.



Commissioner Chris Patten's visit to Afghanistan and Pakistan in 2002

P3P

How can a citizen visiting an Internet site ensure that his personal data are used only in accordance with his wishes? The worldwide co-ordination body involving industry and regulators called the W3C (World Wide Web Consortium) has proposed a standard for defining privacy preferences. This standard is called Platform for Privacy Preferences or "P3P".

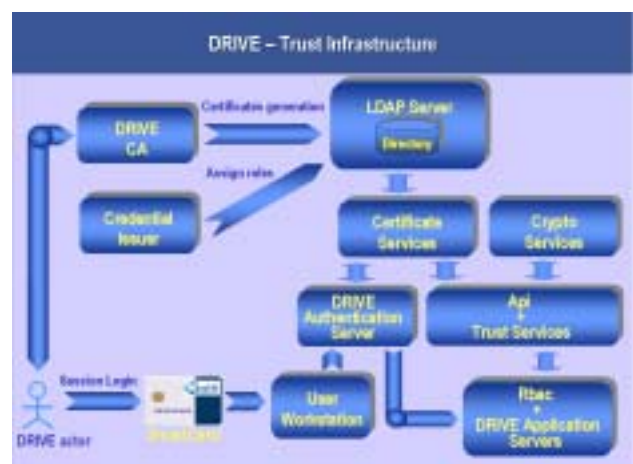
The citizen specifies what data he is willing to supply, and the website specifies what data it needs. The JRC has developed the first complete reference implementation of the P3P standard, building a software agent which checks whether the citizen's preferences and the site's requirements are compatible (if they are not, the citizen is warned and asks what he wishes to do). The next stage of the JRC activity will be, in conjunction with the other W3C members, to help the P3P standard

to evolve to full compatibility with EU Data Protection legislation.



DRIVE Project

The DRIVE project – supported by the IST programme – aims at using modern information technology to improve the supply of drugs to hospital patients, by reducing errors and reducing supply chain costs. Trust and the protection of patients' privacy are an essential part of this project. The JRC contribution to this project was the design of the infrastructure for Role-Based Access Control, giving access to patients' confidential data only to those whose roles required this access. The project has concluded successfully, demonstrating that a sophisticated IT supply chain system can be implemented successfully with high user acceptance in a busy hospital, and can reduce greatly the frequency of drug handling errors and patient identification errors.



Sealing clamp based on multi transponders technology

A sealing clamp with a limited construction cost, based on multi transponder technology, was developed at IPSC. This innovative seal has a very good mechanical strength and an unique identification. It can confirm its correct installation, detect an illegal opening and store information in a permanent memory, inside the seal, when required. All the readings/writings can be done automatically through a proper antenna and stored in a database, that can be made available on line and give in real time information about the correct installation, the integrity of the seal and all the readings done in each check point. This product has a very promising potential market. In addition to nuclear applications, it could be used on commercial containers to detect illegal opening and to follow the shipping route from shipment to final destination.

Patent pending: 2694 PP Brevet 13103 27/11/2002



Increasing role of JRC in supporting the economic and financial priorities of the EU

The JRC work on the Capital Adequacy Directive for DG MARKT continued and resulted in a tri-partite collaboration linking the JRC, DG MARKT and the European Investment Bank. In November, DG MARKT published the 11th issue of the internal market scoreboard (a key EU publication) prepared with the support of the JRC, which also became an active member of the Structural Indicators Working Group. The JRC delivered to DG ECFIN an ad-hoc software for output gap and NAIRU (Non Accelerating Inflation Rate of Unemployment – both output gap and NAIRU help to define the position of the economy relative to the economic cycle) estimation based on modern econometrics. DG ECFIN recommended its use to member countries within the Economic Policy Committee of the EU.

Open-source intelligence and risk analysis for container traffic

IPSC developed a research prototype that can provide both up-to-date and historical information on the movements of containers transported by container ships. As a result, data were collected from the Internet

and route-based risk analysis was applied to it. During the project, strictly non-personal data were collected and consolidated into a database. Several instances of indicative evidence for commitment of fraud to avoid anti-dumping duties were detected. These interim research results were valued highly by maritime customs intelligence. IPSC's development is of obvious use to antifraud for both operational intelligence (reactively looking for indicative evidence) and strategic intelligence purposes (proactively looking for trends and early warnings). By focusing exclusively on container routes, IPSC's methods complement national-level risk analysis practice in customs, as the latter tends to focus on more locally-controllable parameters like the goods transported or the agents involved.

Monitoring equipment for Ulba

The Ulba Metallurgical Plant in Northern Kazakhstan, once the Soviet Union's largest source of nuclear fuel, remains a major producer. In 1999, a nuclear safety cooperation agreement with the European Atomic Energy Committee brought the facility into the fold of the International Atomic Energy Authority. To help it meet globally accepted standards, the EU pledged support for improvements in accountability and the security of uranium stocks at the site. IPSC staff designed and supplied special monitoring instrumentation, namely the Multi Tank Scanning System (MULTAS), a metal cap sealing and identification system, and a portable digital surveillance system comprising 15 tele-camera surveillance systems plus acquisition stations for installation in nuclear material storage areas. They also provided training to local technicians in a training room facility. The official opening took place in Ulba Kazakhstan in October 2002.



Food aid

According to the latest Food and Agriculture Organisation (FAO) report on the State of Food Insecurity in the World (SOFI 2002), some 840 million people were un-

dernourished worldwide from 1998–2000. To support DG Development and AIDCO programmes for Food Security and Food Aid, IPSC is working on improving the information on crop prospects in food-insecure regions. Developments include the integration with land cover information and crop profile assessment for Somalia, the adaptation of the European Crop Growth Monitoring System to Russia, Central Asia and the Mediterranean, the integration of the FAO (Food and Agricultural Organisation of the UN) water balance and agro-ecological zoning in the Horn of Africa. Experimental bulletins are produced, according to needs, on a ten-daily to bi-monthly basis. At the same time, IPSC is playing an important role in international networking and exchange. It initiated, jointly with FAO, two regional networks for crop monitoring for food security, first in South America (Cordoba workshop, November 2002) and then in Africa (Nairobi workshop, January 2003).

Relevant web sites:

SOFI: http://www.fao.org/sof/sofi/index_en.htm/

Bulletins:

<ftp://mars.jrc.it/bulletin/>

Crop monitoring networks:

<http://marsunit.jrc.it/SouthAmerica/>
<http://marsunit.jrc.it/Africa/>



REHAbilitation IT Aid for the PARKinsonians (PARREHA)

Parkinson's disease is a dysfunction at the level of motor planning. Recently, scientists have shown that visual stimulation of Parkinson's disease patients with "virtual" objects and auditory stimulation with rhythmical sounds can significantly improve the efficacy of traditional rehabilitation schemes. IPSC is working on an IST project (IST-1999-12552) called PARREHA, which aims at an innovative IT tool for the rehabilitation of persons suffering from Parkinson's disease.

The project aims to contribute to the EU social policies as well as to improve the standard of living of people suffering from Parkinson's disease. A rapid prototype of the PARREHA VR (virtual reality) training tool has shown impressive results in bringing a person suffering from Parkinson's disease from the "off-state" to

the "on-state". More information on PARREHA is found at:

<http://www.parreha.com/>

The IST 2002 exhibition, held in Denmark in November, included PARREHA in its list of 3 "Gee-Whiz - You just gotta see this" topics. ("The organising committee has had a lot of fun preparing the IST 2002 event, and evaluating the many ideas submitted for inclusion. These are the items which for us, just had to be included: the ones that seemed to be the most impressive.") Further information can be found at:

http://2002.istevent.cec.eu.int/2002searchtopics/index_en.asp?id=63

Contribution to European directives for the reduction of technological risk

The Major Accident Hazards Bureau (MAHB) was asked by DG ENV, the European Parliament, the Committee of Competent Authorities and the French Ministry to help in the drawing up of lessons to be learnt from the Toulouse accident (2001), and to assist in strengthening the regulations governing the use of ammonium nitrate and, in particular, the Seveso II Directive (96/82/EC). To this end, MAHB organised an international workshop on the subject, performed an ad-hoc analysis and contributed directly to the formulation of an amendment to the Seveso II Directive. MAHB participated in the negotiations with the Council of the European Union on the proposed amendment to the Seveso II Directive, assisted DG ENV in various Council working group meetings and testified before the French national assembly at the enquiry into the Toulouse accident.

Relevant web site:

<http://mahbsrv.jrc.it>

Development, implementation and testing of innovative and powerful statistical data mining tools for the extraction of signals from large databases with applications in the anti-fraud domain

In data mining exercises, a relatively small number of tasks have to be carried out repeatedly on different data sets or with different user-defined parameters. For increased efficiency in carrying out analysis work, convenience in maintenance of methods implemented, and for friendly accessibility and use, and the representation of results in formats that can be easily read, browsed or entered into documents, IPSC has developed a library of macros that evolved out of our work in data analysis of cases of irregularities and fraud reported to the Commission but they are of wider applicability in data mining large volumes of data.

Procedures that have already been tested and implemented allow the production of data dictionaries for variables under analysis, with various filtering capabilities; the compilation and multi-way classification of descriptive statistics, for database variables; the ex-

traction of signals in cross-classifications of counts of categorical variables or aggregates of continuous variables. This work is conceived as leading to the construction of a software accessory that will be running on large databases.

SUCCESSES UNDER ENLARGEMENT

IPSC is firmly committed to providing support to the implementation of the JRC Enlargement Action (<http://www.jrc.cec.eu.int/enlargement/>) that, as a part of the overall European Union pre-accession strategy, is mainly aimed at accelerating the uptake of the technical and scientific aspects of the EU legislation and, thus, at facilitating the progressive adoption of the *acquis communautaire* in the Candidate Countries (CCs).

IPSC is focusing its attention on the promotion of collaborative activities with CCs' research organisations and competent regulatory authorities in its core competence areas that are central to the EU political enlargement agenda. Emphasis is placed on stimulating progressive integration of experts from CCs in the IPSC research activities through the exploitation of a number of instruments that include amongst others:

- Hosting visiting scientists and detached national experts
- Organising workshops and training activities
- Disseminating information and enhancing communication

In line with its mission, the IPSC enlargement effort is mainly aimed at sharing with CCs stakeholders best practices, techniques and methodologies in support to the conception, development, implementation and/or monitoring of EU policies where safety and security are of concern and independence of commercial and national interests are essential. Specific actions have been implemented in the following two major subject areas:

- Monitoring Compliance with EU Regulations addressing issues related to the implementation of the Common Agriculture Policy in support of the Agriculture DG and to the implementation of the Fisheries Policy in support of the Fisheries DG,

- Monitoring and Assessment of Natural and Technological Hazards through the Major Accident Hazards Bureau (MAHB) and the Natural and Environmental Disaster Information System (NEDIES) supporting the Environment DG and the European Co-ordination Centre for Aviation Incidents Reporting System (ECCAIRS) supporting the Energy and Transport DG.

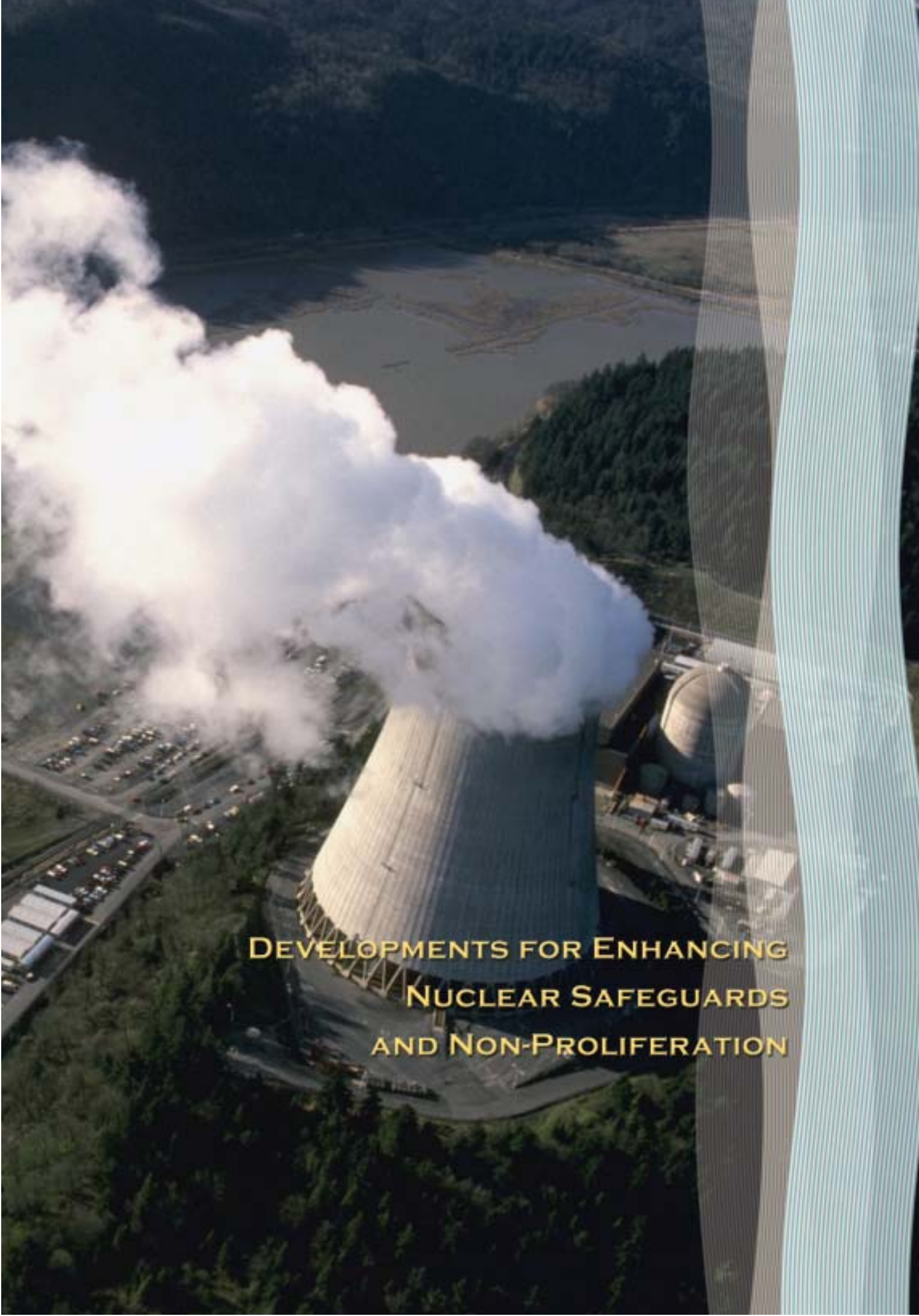
Additional areas of collaborative activities in support of the Enlargement process have been identified and are being planned in the following fields:

- Security, Vulnerabilities and Econometrics addressing issues relevant to cyber-security, antifraud and statistical estimates and forecasts,
- Livestock Traceability focusing on issues relevant to the electronic identification of animals,
- Monitoring Illicit Discharge from Vessels to share techniques in tracking and mapping deliberate discharge from vessels with emphasis on oil slicks,
- Non-Proliferation and Nuclear Safeguards to enhance integration in the R&D activities carried out by IPSC in the framework of the Euratom research programme.

In view of the EC initiative aimed at the establishment of a European Research Area (ERA), IPSC attaches great importance to pan-European collaborative research activities within and beyond the framework of the Enlargement process to meet the strategic objective of a European most competitive knowledge based society.

Code	Irregularity	FA code	FA code	Priority	Pending the payment
AGRICULTURE					
AG01	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG02	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG03	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG04	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG05	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG06	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG07	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG08	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG09	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG10	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG11	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG12	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG13	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG14	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG15	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG16	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG17	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
AG18	Insufficiently detailed description of the irregularity	1000	1000	1000	1000
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A control campaign in Slovenia



**DEVELOPMENTS FOR ENHANCING
NUCLEAR SAFEGUARDS
AND NON-PROLIFERATION**

DEVELOPMENTS FOR ENHANCING NUCLEAR SAFEGUARDS AND NON-PROLIFERATION

Stopping the further spread of nuclear and other weapons of mass destruction is a complex task requiring international co-operation, legal instruments and treaties and a wide range of technological means to support verification of compliance with the treaties. The Non-Proliferation and Nuclear Safeguards (NPNS) unit provides research, technology, instruments, technical services and training to support various national and international organisations involved in this quest.

Verification and control related to non-proliferation of nuclear materials is performed in the EU by the European Commission's DG TREN (Euratom Safeguards) within the context of the Euratom treaty, and, in the world, by the International Atomic Energy Agency (IAEA) within the context of the Non-Proliferation treaty. NPNS gives scientific, technical and training support to both these organisations. NPNS also supports national organisations (e.g. in Russia and in Kazakstan) and facility operators in establishing efficient and effective nuclear material accountability and control systems.

1.1 Non-Destructive Assay Laboratory (PERLA)

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PERLA is a laboratory for the assessment and performance evaluation of non-destructive assay (NDA) techniques applied in the safeguarding of nuclear materials. Its main strengths rely on the availability of a unique collection of well-characterised nuclear reference material, a wide choice of NDA instruments and experienced staff. This places PERLA in a dominant position in the European and world-wide panorama of nuclear safeguards.

Work in PERLA includes gamma spectrometry, active and passive neutron counting, calorimetry and integrated systems. The primary tasks being oriented along three main lines:

- performance evaluation and calibration of NDA instruments, including assessment of components, analysis software and procedures,
- development of new NDA instrumentation and methodology,
- training of nuclear inspectors.

A project was started that will lead to the complete computerised management of activities in PERLA, including the development of a database for storing information about reference samples, instruments, sources and measurements. A first step involved the development of the gamma spectra library. This library stores the measurement results obtained by gamma spectrometry on PERLA reference samples, using various equipment and under different measurement conditions. This library will soon be accessible on the World Wide Web to anyone wishing to check the performances of his/her own spectrum analysis method.

1.2 Neutron Measurement Techniques

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Research & Development

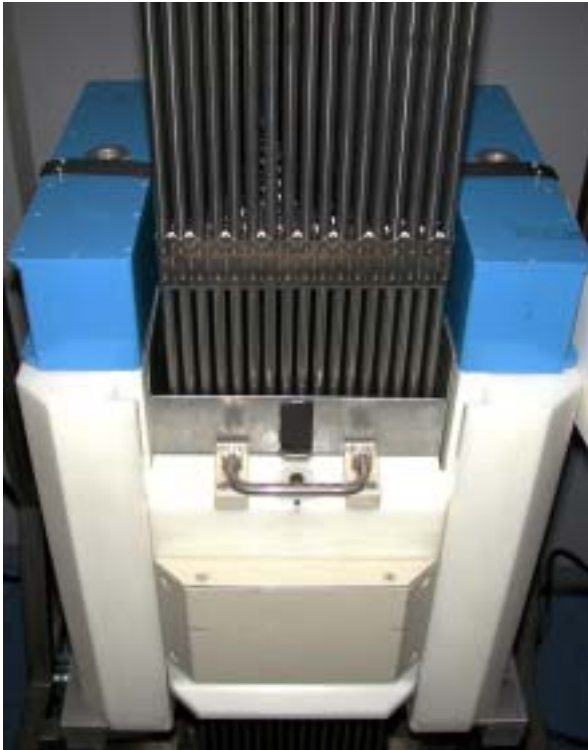
The development of models for the simulation of neutron counters and their validation versus experimental data, will allow in future, the reduction of the calibration effort and of the requirement for costly reference materials. The JRC has developed the Monte Carlo N-Particle transport - Pulse Train Analysis code (MCNP-PTA). This code combines the traditional MCNP code for neutron transport with a Pulse Train Analyser (PTA) that simulates the operation of shift register electronics, allowing the complete analysis of neutron coincidence counters. Latest improvements to MCNP-PTA allow a better simulation of passive counters with the possibility to generate automatically the inherent source, directly computed from the material description.

In support of the research programme in nuclear safeguards a new experimental device is being constructed. This device, named Pulsed Neutron Interrogation Test Assembly (PUNITA), is intended for research in NDA methods for the characterisation of fissile material of low quantity. A particular feature of PUNITA is the interrogation of the fissile material with repeated pulses of thermalised neutrons produced by a neutron generator. The lower limit of detection is expected to be state of the art for materials such as uranium and plutonium. PUNITA is currently in the process of obtaining a licence to operate (the safety report has been issued). This phase should be completed by the end of 2003.

Support to DG TREN (Euratom Safeguards)

An important new application of Monte Carlo is the calibration of neutron counters when no suitable reference material is available. A challenging case was presented by the FRM-II fuel elements (to be loaded into the new Munich reactor), which contain 93% enriched uranium. A specific collar was adapted by the JRC and installed at the CERCA fabrication plant in Romans-sur-Isère (France). The response function of the collar was calculated using the MCNP-PTA code. The code was previously validated using PERLA nuclear reference material. The methodology allowed the verification of the fissile

content with an accuracy of 1%. This was the first application of Monte Carlo for absolute calibration of neutron counters.



Neutron collar measuring a fuel element

The JRC began a collaboration with DG TREN (Euratom Safeguards) in 2000, to study a verification method for low enriched uranium (LEU) as a replacement of the traditional active interrogation with the PHONID device. A new measurement method, based on the detection of neutrons emitted after the spontaneous fission of ^{238}U , has been investigated. Feasibility of the method has been demonstrated through a campaign of measurements performed with an Active Well Coincidence Counter (AWCC) on PERLA LEU reference materials. The results showed that the real coincidence rate of measurements with a cadmium liner was a good indicator for ^{238}U mass. So a passive neutron assay, combined with gamma spectrometry to measure the enrichment, can satisfy the verification requirements. The low neutron yield of ^{238}U requires a high efficiency detector to keep the counting time reasonably short. The JRC designed, built and characterised a first prototype of a High Efficiency Passive Counter (HEPC).

This prototype was tested with PERLA Uranium reference materials and allowed us to validate the method and assess its accuracy to better than 1%. Two new detection systems for the DG TREN (Euratom Safeguards) inspectors at the Dessel (Germany) and Juzbado (Spain) fuel fabrication plants will be commissioned in 2003.

Support to IAEA

The International Atomic Energy Agency (IAEA) requested a study on the influence of gas pressure in ^3He detectors for neutron collars in order to optimise their equipment. The study was carried out combining experimental measurement and Monte Carlo calculations.

Two experimental campaigns were held in PERLA in a joint activity involving the JRC, IAEA and the University of Rome. The purpose was to test software developed by the University of Rome under IAEA specifications. This method allows the simultaneous measurement of both the element U/Pu content and the isotopic composition by a single gamma/X-ray acquisition.

1.3 Gamma Spectrometry Measurement Techniques

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Research and Development

Gamma spectrometry is mainly used for the determination of the isotopic composition of nuclear material. The software for the evaluation of radiation spectra for this purpose is still evolving. An ongoing activity in this direction is the test of the NaIGEM code to characterize its reliability for the practical use by inspectors, especially for measurement situations with thick filters and wide-angle beams. A new direction for the use of gamma radiation is the test of single photon emission tomography for the mass determination of small samples with unknown or irregular geometry. Such a technique may be complementary to neutron methods. As a first step, the mass attenuation coefficients of plutonium were measured.

Support to IAEA

The IAEA has carried out a coordinated research project concerning the Detection of Illicit Trafficking of Nuclear Material. This work has been supported by delivering gamma spectra of uranium and plutonium to the participants of the project.

1.4 Unattended Measurement Station for Low Enriched Uranium Fuel Assemblies

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The Unattended Measurement Station (UMS) for fresh low enriched uranium fuel assemblies, was installed at the Franco Belge de Combustible Nucleaire fuel fabrication plant at Romans-sur-Isere in France. The UMS, one of Europe's first unattended safeguards measurement instruments, was developed and tested at Ispra under

the support program to DG TREN (Euratom Safeguards) and provides neutron coincidence counting measurement (a neutron collar) and optical identification of the assembly. The measurement station is designed to function in this fabrication facility, as a safeguards instrument providing unattended service for 100 working days without the intervention of an inspector. The instrument is integrated into the production flow of the plant and will be operated by facility personnel. The UMS has been designed for dual-use (plant operator and inspector), and breaks the paradigm of separating safeguards from operation. This preserves the industrial productivity of the plant, and yet guarantees the highest levels of safeguards.

Once the assembly is loaded into the UMS, the measurement and identification are carried out automatically by the system, without any intervention of facility personnel. The fuel assembly identification was developed for this application at the JRC. It is a laser system based on 2D/3D Images combined with optical character recognition. Measurement results generated in automatic mode are based on automatic background and performance monitoring. The UMS used in this way in a safeguards approach can verify all of the assemblies produced in that production line. The safeguards inspector has only to configure the instrument for the type of verification that is required during the next unattended period.

1.5 Surveillance and Information Retrieval

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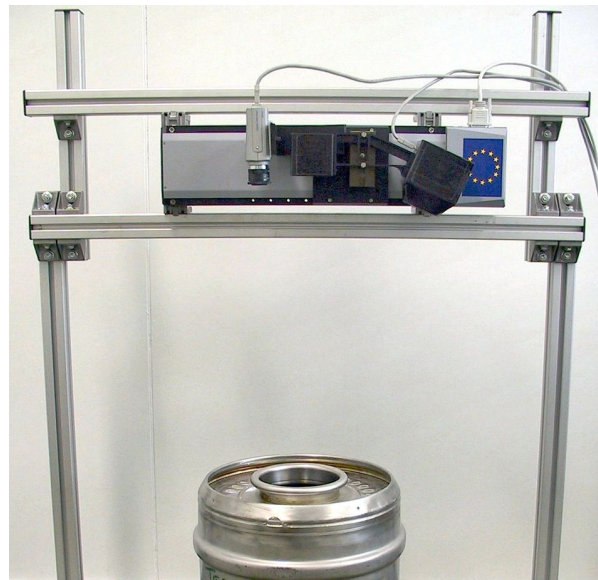
NESTOR

NESTOR is a collaborative project under the Innovation programme. The scope is to build and demonstrate in two hospital environments (Giessen-D and Copenhagen-DK) an autonomous motorised platform capable of transporting small packets between different hospital services. This will free hospital staff from repetitive, low-added value tasks. Essential to the success of the project is the Human-Computer Interface (HCI), which considering the European market, needs to be multilingual and configured according to specific hospital procedures and country cultures. The role of the JRC is twofold: i) design and implement the HCI at different levels: fixed station, mobile platform, nurses' computers, wireless access; ii) High level Supervisory system based on DB architecture. All communications between the system components are wireless, including the monitoring and access of nurses and system operators.

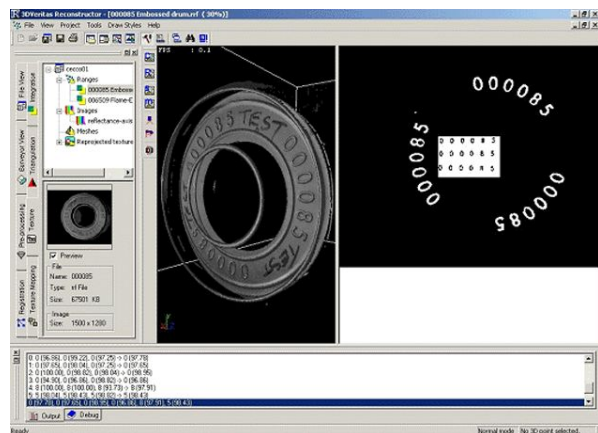
Identification of Waste Containers using 3D Laser Technologies

Nuclear waste containers are normally identified by a set of alphanumeric characters that are either en-

graved, embossed or flame-etched on one of the sides of the container. An integrated identification system was developed accepting any of the three types of waste containers. The system is based on 3D laser-scanning technologies combined with a camera, and automatically recognises the identification string of the containers. This technique is more robust and efficient than conventional camera based reading systems, which can be affected by spurious illumination sources, and poor contrast. This 3D-based identification solution can be used with any type of nuclear container.



Integrated System for Drum Identification



Human Computer Interface for Drum Identification

3D Laser Surveillance

There are situations where visual surveillance proves ineffective in detecting changes, which may be either too small to be reliably detected or generated by inconsistent illumination. High security installations need reliable, independent and effective sensors capable of maintaining IPSC SIR sector introduced the concept of laser surveillance (both in 2D and 3D) to complement exist-

ing video surveillance systems. This led to the development of a new low-cost prototype of Combined Video and 2D/3D Laser Surveillance system. The system generates its own alarms, which can be used to trigger already existing surveillance systems for improved security and performance.

Design Information Verification

Design Information Verification (DIV) activities are currently highly labour-intensive and time-consuming. They are mostly carried out by visual inspection, the taking of photographs and reference to engineering drawings. In addition, current techniques do not offer the level of accuracy and conclusiveness now possible with contact-less laser ranging techniques. IPSC is developing an efficient system based on laser range scanning technologies to effectively and conclusively record detailed constructional information, in support of the Design Information Verification (DIV) of large and complex industrial nuclear facilities such as new reprocessing plants. The system will acquire 3D pictures in these facilities (buildings, cells, equipment, pipe-works, etc.) and automatically highlights the changes from previously acquired reference material, ensuring therefore the continuity of knowledge of the original verification.

Robotics for Advanced Storage Areas



Robotics Inspection Vehicle for Advanced Storage

The increasing amount of nuclear materials to be stored leads to the search of new storage solutions, capable of adhering to the highest standards of reliability, containment and security and lowest radiation exposure. The new generation of intelligent robotics technologies can provide technical answers to the different problems associated to the long-term storage of fissile materials. The RIALTO laboratory designed and integrated the Robotics Inspection Vehicle – RIV, an in-door agile mobile platform with an articulated arm and a variety of sensors, conceived for inventory verification, surveillance and inspection of fissile materials in future large-size

storage areas. Kinematics algorithms, remote user interfaces with camera viewing, and interfaces for navigation sensory systems were developed as well. RIV is a demonstration project aimed at the evaluation of solutions for unmanned and highly secure operations inside storage areas which contain fissile materials originated from dismantled nuclear weapons under international verification regimes.

Remote Data Transmission (including VPN - Virtual Private Networks)

The importance of Virtual Private Networks (VPN) is growing. VPNs guarantee secure data transmission over intrinsically insecure communication media and can be used with low cost public communication networks. A VPN link was established between the JRC and DG TREN (Euratom Safeguards). All communications were based on the use of Internet protocols over the public ISDN network. This VPN allowed the remote connection of a self-contained surveillance system. With this configuration, it was possible for inspectors to: a) download, at any time, video data collected at the remote surveillance system at Ispra, b) the real-time visualisation of the remote surveillance camera(s) installed at Ispra, c) the configuration of the remote surveillance system, and d) the interrogation of the Status-of-Health. Performance measurements were made indicating that VPNs are a good solution for establishing remote monitoring solutions in safeguards.

1.6 Non-Proliferation Information and Analysis Centre (IAC)

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IAC is a system that collects, analyses and validates information concerning nuclear non-proliferation issues. The information is gathered mainly from open sources and allows a user to produce studies on related subjects, such as country profiles. Besides the collection of data, VERITY software was adapted to the IAC needs after an accurate study of the Verity Portal One Application Suite. The adaptation of the Management System to IAC, has lead to a testing phase and continuous personalization of the system. This system is working along side the previous manual collecting and classifying method. Users have been provided with a personal account to access, through the Web, the various personalised modules described below and to validate them:

- Search module, which allows the user to perform basic or advanced queries on the collection.
- Web searching module, to allow searches in the Web.
- Different knowledge trees, to give more than one view of the documents (i.e. a knowledge tree where documents are organised in categories referring to

Countries and another one where the categorisation refers to the Nuclear Fuel Cycle).

- A folder shared by all users, where each user can download documents to be inserted into the collection.
- Personal news page, where the agent server notifies the user of new documents, he may be interested in.

Each of these elements (except the Web Searching module) refers to the core element, which is the collection. The system can handle large volumes of data in a variety of formats and allows efficient indexing, searching, retrieving and displaying of the data. The use of such an Information Management System facilitates not only the classification and the searching of documents of interest, but also the management process.

Geographic Information Systems
in Nuclear Safeguards: SIT and NUMAS

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The implementation of the Additional Protocol requires the development of support tools based on advanced Information Technologies to deal with the huge amount of information collected. The aim of the SIT project (Site Investigation Tools) is the development of informatics tools to support the declaration (SIT-D), verification of declarations (SIT-V), and inspection activities (SIT-I). All these tools are based on low-cost GIS (Geographic Information Systems) platforms and make use of several other technologies, such as CAD, Remote sensing, GPS, and Web applications. The basic versions of SIT tools are being improved in this context and with the cooperation of the IAEA and ESO are being applied to the declaration of the Ispra site.



Screen dump of NUMAS showing the distribution of nuclear locations, together with the main attribute dialog box of a selected site and its VHR satellite image

NUMAS is a new software development, based on a GIS platform, aimed at providing a comprehensive database of nuclear fuel cycle activities for different applica-

tions. NUMAS works as the GIS interface to the IAC, to represent information on nuclear sites graphically. Using the Verity Portal One system, access to related documents is straightforward and will allow, for example the generation of country profiles. NUMAS will also be used to support the satellite image interpretation and the reporting of nuclear sites. Besides IAC the analyst will be able to access in-house technical information on the nuclear fuel cycle that is organised in commercial knowledge databases.

1.7 ESARDA

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The European Safeguards Research and Development Association (ESARDA) remains the most important cornerstone of co-operation between similar organizations involved in safeguards R&D in Europe. In 2002, ESARDA organised its 24th Annual Meeting in Luxembourg, with the participation of more than 170 people, the proceedings of which will be issued during spring 2003.

ESARDA is currently preparing for the challenges that enlargement of the EU will bring: most of the candidate countries have a nuclear industry and reactors, and the institutions that are involved in Safeguards R&D have been informed about these activities and will be invited to join ESARDA. The possible influence that changes taking place on an international scale could have on ESARDA activities is presently being taken into account. As an example, the Working Group on Verification technologies and methodologies will have its first meeting in early 2003.

After a few years of inactivity, ESARDA published its Bulletin n°31, with the intention of establishing a peer-reviewed section.

The new website has been launched <http://www.jrc.cec.eu.int/esarda> and should become the cornerstone of internal and external communication.

1.8 Mass and Volume Determination Techniques

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IPSC is involved in activities related to the measurement of volume and mass of liquids in nuclear facilities in support of safeguards nuclear material control and accountancy. The activities of measurements and design development of instruments, as well as extensive training of inspectors and personnel under TACIS projects, for Russia and Kazakhstan, are performed in the Tank Measurement (TAME) laboratory. In-field support activities on tank calibrations in the Rokkasho facility Japan, have been undertaken working jointly with the IAEA, providing both manpower and purposely de-

veloped instruments namely the modular unit of the UVMS (Unattended Volume Measurement System).

Under the TACIS project for Kazakhstan a number of instruments have been supplied for installation in the ULBA fuel fabrication facility, namely the Multi Tank Scanning System (MULTAS), a metal cap sealing and identification system, and a portable digital surveillance system comprising 15 telecamera surveillance systems plus acquisition stations for installation in nuclear material storage areas. An inauguration of the training room facility, commissioning and official opening was held in ULBA in Kazakhstan in October 2002.



Training Room in ULBA showing tanks similar as to those installed in the facility

1.9 Sealing and Identification Techniques Laboratory (SILab)

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IPSC specialises in developing sealing and identification techniques that were originally requested for the safeguarding of nuclear material, such as fresh or spent fuel containers and transport/storage casks. IPSC produces the seals/identifiers, the reading heads, all the portable equipment with the acquisition and data processing, the related custom designed software and the site-specific installation/removal tools to be used by the inspectors.

Ultrasonic Sealing and Reading Heads

Ultrasonic sealing systems are used for the sealing of nuclear items, such as, fuel assemblies or containers, which are used either inside a plant (a reactor) or during the transportation or the storage of such items in adverse environments like fuel storage ponds, reactor cores, nuclear transport containers, etc. Ultrasonic seals called "Sealing-Bolts" or "Sealing-Nuts"

are already applied for the sealing of a large number of spent fuel containers in storage areas of large reprocessing plants (more than 1000 seals have been installed).



Simplification of seal design: the cost of the seal on the left is more than twice that of the newly designed seal on the right

Recently IPSC recognized the need to develop an innovative ultrasonic sealing system. The design of the bolt itself has been simplified, along with the reading head with the aim of reducing costs and weight. A special low cost box is used as an interface allowing the use of a standard portable computer for reading and data acquisition. The new system is fully compatible with the previous one. Rupture of the identity, when the bolt is unscrewed, occurs in torsion after about 100 degrees of counter rotation. The rupture realized forcing the pin in torsion. The rupture realized forcing the pin in torsion. The flat surface given by the rupture in torsion, allows a better ultrasonic signal when reading the broken identity-integrity. In the previous design the rupture of the nail was in traction, the surface after separation having a conical shape. The conical shape gave rise to a weaker ultrasonic echo when read, that was sometimes difficult to analyze. With the rupture in torsion the resultant signal is stronger and easier to be processed.

The comparison between sealing bolts in the old and new design are shown in the figure. As shown, the number of parts of the seal have been reduced and the machining simplified with the cast being reduced to less than half.

Remote Handling Tool to automatically Manipulate a Reading Head

To manually position an ultrasonic reading head underwater to read a sealing bolt, is a difficult task that requires a skilled team of operators, on the bridge of the storage pond crane. An automated and tele-operated positioning system, guided to the target through a CCD

camera and a force/torque sensor, is under development at IPSC. This positioning system is able to recognize, with the CCD camera, a sealing bolt underwater within an area of one square meter and to automatically drive the reading head to couple to the bolt head. The force sensor stops the movement of the positioning system, along the vertical axis, when the abutment 'cone to cone' between reading head and sealing bolt is correctly realized. With this innovative equipment, it is sufficient to move the bridge to within one square metre of the bolt to be verified, and to start the positioning system that automatically recognizes the sealing bolt and positions the reading head.

Technical Assistance to Community of Independent States (TACIS) tasks support in the construction of a training Pu Laboratory at Snezhinsk

IPSC is responsible for the definition and technical coordination of two TACIS projects (R5.04 1997 and R5.04 1998) devoted to the commissioning of a Plutonium Laboratory at Snezhinsk in the Russian Federation, to train operators and inspectors in the whole of the Ural Siberian area.

Technology transfer along with the fabrication and procurement of specific equipment is under way. In particular the IPSC ultrasonics equipment with reading heads were fabricated and delivered to Snezhinsk, also training was given to the future operators.

1.10 Environmental Testing Laboratory (TEMPEST)

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The TEMPEST laboratory upgraded its testing potential with the installation of a new anechoic chamber for radio frequency immunity testing and measurement. A new generator for the testing of the safety aspects of the electric/electronic devices is also now available as well as a new transport simulator.

Support to DG TREN (Euratom Safeguards) and IAEA

The International Atomic Energy Agency (IAEA) and DG TREN (Euratom Safeguards) continue using the TEMPEST laboratory facility for the testing of their instruments. Surveillance systems and electronic seals were tested under a new test procedure especially developed by the JRC for safeguards equipment. The tests include temperature, humidity, vibrations and electromagnetic disturbances.

Awards

The TEMPEST laboratory upgraded its testing potential with the installation of a new anechoic chamber for radio frequency immunity testing and measurement. A

new generator for the testing of the safety aspects of the electric/electronic devices is also now available as well as a new transport simulator.

In 2002, the French Committee of Accreditation (COFRAC) officially accredited the TEMPEST laboratory under the ISO 17025-quality standard.



Internal view of the anechoic chamber


Patents

- Organe de fixation à intégrité contrôlée; 2692 PP Brevets 11473, which is a sealing bolt including an electronic identity and integrity based on passive transponder technology.



View of the bolt

- Scellé multi-usage à serrure; 2676 PP Patents 312126 which is a padlock including an electronic identity and integrity based on passive transponder technology.
- Mesure de résonance de transponder passifs à 134.2 kHz à l'aide de trois antennes; PP 2695 which is a new method for resonance frequency measurement of passive transponders.

A large blue and red ship is shown from a low angle, with its bow and anchor visible. The ship is on a dark blue sea. In the background, there are snow-capped mountains and another smaller ship. The sky is clear and blue. The text is overlaid on the lower part of the image.

**TECHNOLOGIES FOR EFFECTIVE COMPLIANCE
MONITORING OF EU REGULATIONS
AND COMBATING FRAUD**

TECHNOLOGIES FOR EFFECTIVE COMPLIANCE MONITORING OF EU REGULATIONS AND FIGHTING FRAUD

Frauds on the EU are losses borne by all the taxpayers and traders of Europe and strike at the roots of democratic societies, based as they are on the rule of law and its enforcement. The social impact of fraud is a loss of public trust and confidence in European institutions. Even apart from the direct impact on the EU budget and on public confidence, the stakes involved with non-compliance of regulations can be enormous. Recent developments in technology – high confidence computing, high resolution satellite imagery, fast communications, the Internet and DNA fingerprinting – have the potential to provide a more effective monitoring of EU regulations.

2.1 Monitoring Regulations for Sustainable Fisheries

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It is now almost universally accepted amongst the scientific community that overfishing and inappropriate fishing practices have been responsible for both local fish stock collapses and dwindling global catches. The solutions proposed, both by the Commission, in its reform of the Common Fisheries Policy, and by the recent World Summit on Sustainable Development at Johannesburg, include improved reporting, enforcement and control of fishing vessels.



The EU's main instrument for monitoring the position of fishing vessels is the Vessel Monitoring System (VMS), which is compulsory for all vessels over 24 metres registered in the EU or fishing in EU waters. This on-board system transmits the vessel's position to the flag state and the coastal state on a regular basis – the typical period between reports being about an hour.

IPSC has been investigating how satellite imagery can help detect and identify vessels whose VMS is not functioning. Trials in the Flemish Cap, North Sea, Bay of Biscay and the Azores showed that analysis of Synthetic Aperture Radar (SAR) images from the Canadian RADAR-SAT satellite could allow the detection of virtually all steel-hulled boats subject to VMS. By correlating their positions with VMS-derived positions, vessels not carrying VMS could be identified.

In 2002, IPSC co-ordinated a partnership involving industry, research organisations and fisheries authorities which undertook pilot tests in Rockall, Cantabrico and the NEAFC (North East Atlantic Fisheries Convention) redfish fishery. The Cantabrico region includes two areas where fishing has been stopped for conservation purposes. The new study concentrated (1) on reducing the sea-noise in the images so as to reduce the minimum size of vessels that can be detected or increase the stretch of ocean covered by one image and (2) on improving the speed with which information can be sent to the authorities. It was found that the SAR processors used at certain ground stations were more effective than others at noise reduction. Following experimentation at the IPSC focusing unprocessed images, recommendations were issued for the following year's studies. Response speed was increased by automation of algorithms and in December 2002, a high bandwidth satellite communication link was established between the ground station at Tromsø, Norway, and Ispra. Finally, at the end of the year, Council Regulation (EC) No 2371/2002 of 20th December 2002 stipulated that Member States should include the capability of satellite-based systems in their monitoring infrastructure.



IPSC is also supporting Commission efforts to develop a secure harmonised logbook for better reporting of catches and, together with other European partners, is establishing a database of the genetic characteristics of European marine fish.

2.2 Anti-fraud Compliance Monitoring

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IPSC has focused its efforts on finding ad-hoc solutions to selected problems in antifraud, either signaled directly by the European Anti-Fraud Office (OLAF) as priority, or brought to IPSC's attention through other contacts with practitioners in the field. A broad range of technologies and analytical techniques were used to produce solutions that are context-specific and demonstrate European added-value.

In 2002, IPSC made advances in intelligence gathering and risk analysis for container traffic, in data warehousing of import-export trade data for sensitive goods, in methods and tools to service multi-linguality requirements in antifraud, and finally, in systematic information gathering and classification systems in selected domains.



EU15 exports of fish products (live fish)

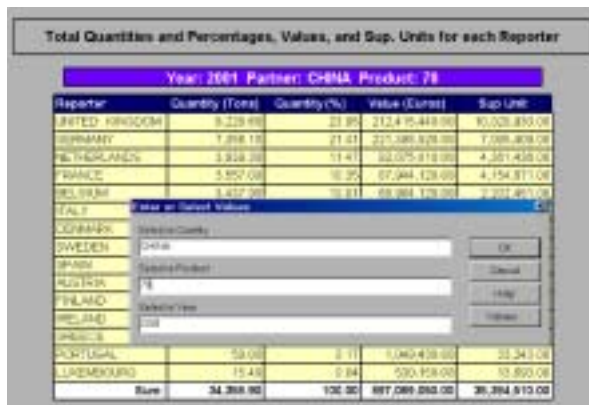
In all these areas, IPSC made a significant effort to disseminate its project results with national authorities, industry, and where appropriate, academia. In 2002, IPSC signed an MoU (Memorandum of Understanding) with OLAF with a view to strengthening the collaboration between the two services.

Open-source Intelligence and Risk Analysis for Container Traffic

IPSC developed a research prototype that can provide both up-to-date and historical information on the movements of containers transported by container ships. Further information can be found in the High-lights section on page 11.

Decision-Support for External Trade

The database COMEXT (Commerce Extérieur) of EURO-STAT is the basis for all sorts of analyses involving external trade by many EC departments, national authorities and international organizations. IPSC has developed a complementary capacity whereby COMEXT data about a number of product families (meat & dairy, fish, textiles) is transformed and consolidated with a view to providing more effective access to information for use by practitioners of customs policy or antifraud, market analysts and trade negotiators. Navigation and “drill-downs” are possible, as are also some basic indicators about volumes and directions of trade, all using a standard Internet browser.



carried out by other human indexing professionals and agreed with 78% of their manual assignments. As the agreements human-machine versus human-human are comparable, the automatic assignment process can be considered to have been rather successful.

Systematic Information Gathering and Classification

IPSC developed a system to keep intelligence analysts in OLAF informed of articles related to selected risk areas, like cigarette smuggling or illegal activities in enlargement countries. The system is capable of gathering documents from web sites in several languages, indexing and classifying them according to a set of predefined interest profiles, and, finally, ranking them for their relevance. Most of the effort goes into assuring that the automatic process delivers only the most relevant documents to the end-users.

2.3 Implementation and Control of CAP

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IPSC provides an essential technical support to DG AGRI and Member States for the implementation and the control of the Common Agricultural Policy, focusing on the area-based subsidies for arable crops, part of the Rural Development Plan, Olive Tree GIS and Vineyard Registers. The national systems aimed to manage and to control these aids (representing a total budget of circa 30 Bio EUR/year) have to comply with the EU regulations. This raises technological challenges linked to Geomatics (remote sensing, GIS, GPS), IT and telematics, for which the MARS Unit of IPSC is recognised as a reference Centre, likely to carry out technological watch, propose and promote best practices.

In 2002, IPSC issued in close collaboration with DG AGRI a number of technical documents (Discussion papers, Technical Recommendations) for the Member States. IPSC organised 4 thematic workshops attended by almost all European countries: Agri environmental measures and rural Development (February), Olive-Tree GIS (June), Vineyard GIS (September), GPS and Parcel measurement (December).

The control with remote sensing has been deployed operationally over 137 control sites in Europe in 2002. MARS coordinated and controlled on behalf of DG AGRI the work carried out by 13 Member States. MARS's strong involvement in the Audits carried out by DG AGRI was confirmed in 2002 (Quality control of 6 national contractors, participation to 5 Audit missions). Similar support was provided to OLAF (Controls related to irrigation in South of Spain), and the Court of Auditors (organisation of a training course for the Auditors).

Web site <http://mars.jrc.it/control/>

Important challenges are related to the implementation of digital land parcel identification systems and GIS, combined with orthophotos coverage (Council Reg. 1593/00). MARS initiated a comprehensive work program to benchmark GPS systems in single mode, EGNOS and GALLILEO systems, for the parcel measurement and more generally the development of mobile GIS tools. Very High Resolution satellites (IKONOS, EROS and QUICKBIRD launched in 2002) appear to be very promising for the georeferencing, the control and the measurement of parcels or agricultural features and various tests are coordinated in Europe to evaluate the operational capacity of these systems (cf first pilot orthocorrection of Quickbird data of Cyprus).

Web sites <http://mars.jrc.it/lpis> or http://mars.jrc.it/wine_olive/

Candidates Countries

The direct involvement of IPSC in supporting the Candidate Countries in the implementation of "Acquis Communautaire" started in 99 and reached a very high level in 2002, through extra credits allocated by DG JRC to this activity.

MARS PECO activities were co-ordinated with DG AGRI (Units AGRI J3 and AGRI AII.2) as well as DG ELARG (TAIEX). More than 110 experts from CC participated in the 6 workshops, seminars and conferences organised by the MARS Unit. Working relationships are presently established with the 13 Candidate countries. Networks of experts and responsables of the national Administrations cover the main sectors of interest: arable crops, Olive Tree, Vineyard, as well as Rural Development.

The participation of MARS experts in 6 Peer Review missions organised by DG ELARG confirmed the role of the MARS Unit as a reference for all the issues related to the management and control of the CAP subsidies.

Web site <http://mars.jrc.it/peco/>

In 2002, IPSC initiated new applications and partnerships closely linked to its present expertise: Cadastre & Multipurpose large scale mapping: MARS participated actively to the 1st Congress of European Cadastre, organised by the Spanish presidency in Granada (May 2002). In October 2002 IPSC hosted the first Committee of European Cadastre. An Inter DG Agreement was signed with DG REGIO for a support on the Greek Cadastre. IPSC initiated an exploratory research on traceability and agriculture, focusing on the level of agriculture production: Geo-tracking of farming practices and certification of products as a contribution to the Food Safety/Quality concern.

2.4 Electronic Traceability of Livestock and Meat (IDEA project)

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Within the termination of the IDEA project concerning the electronic identification of bovine, buffalo, sheep and goat, in December 2001, more than 15 000 000 data points were processed for statistical analysis and results evaluation. The final report was written and sent by the JRC to DG AGRI and DG SANCO in April 2002 with the detailed results of each subproject as well as a complete analysis of the overall results resulting on recommendations for a possible full implementation of this technology at European level.

A web site containing the final report was set-up for the public diffusion of the IDEA project results:

Web site <http://idea.jrc.it>



As the results of the IDEA project were very positive, DG SANCO prepared a new European Regulation proposal for individual identification of sheep and goats, including electronic identification, with the support of the JRC. The JRC will be in charge of the preparation of the guidelines and procedures for the implementation of this new regulation, which will be presented to the European Parliament and the European Council in 2003. The guidelines and procedures under preparation will mainly deal with the following aspects:

- Description of the various electronic identifiers and readers.
- Tagging of the animals, reading and recovery of the transponders.
- Technical concepts for the selection of the transponders and readers including testing aspects, conformance, performance and compatibility.
- Data dictionary, data processing and data base aspects.

The activities of the unit continued in two different projects of animal electronic identification and meat traceability, the so called "Agnello di Roma" project and the QLK1-CT-2001-02229 Project "Electronic Identification and Molecular Markers for Improving the Traceability of Livestock and Meat".

The main activities can be summarised as setting up new test procedures and measurement methods, testing of the devices including new 13.56 MHz passive transponders and readers for carcass electronic identification, as well as in-field intervention mainly for the study of the environment (including electromagnetic disturbances) where the systems are used, for the optimization of the reading points in farms and slaughterhouses. The various electromagnetic measurements performed up to now give a huge amount of information on the various disturbances that affect the performances of the electronic identification readers. These measurements allow increasing overall efficiency of the system. The laboratory tests for the performance study of the electronic identification systems can be more closed to the real environment. The informatics aspects linked to data collection and process is also studied in a systematic way.

IPSC organized a workshop on animal electronic identification and Blue Tongue disease held in Teramo (I) in December 2002 with the participation of the PECO countries. New workshops with the PECO and Enlargement countries will also be held in 2003.

2.5 Data Analysis and Risk Analysis in Support of Antifraud Policy, and Advanced Statistics for the Clearance of Accounts

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In 2002, work in Data Analysis and Risk Analysis in Support of Antifraud Policy, continued to address two issues:

- The assessment of data quality in cases of fraud and irregularities reported by Member States to have been committed against the EU budget, and
- The development of statistical methods for the extraction of knowledge from large databases, the representation of such knowledge and the implementation of such methods into software with user-friendly interfaces for input of raw data and parameters.

The assessment of data quality in cases reported by Member States in 1994-1998 was completed for cases against the Structural Funds. Results and findings were reported internally to the Commission. Data quality comprised the following considerations: missing, uninformative or incoherent values; rules applicable on the

variables in the database, ambiguities in the definition of variables in the database, redundancies in variables that may make data collection and analysis cumbersome, and absence of requisite information. Data quality may become an open-ended endeavour if it is not guided by a view to an “information product”, i.e., the specific objectives for which use is made of the data available. Such objectives have been the estimation of the fraction of payments made irregularly or in fraud and the classification of the reported cases with a view to commission and reporting of irregularities or fraud and recovery of amounts unduly paid.

Earlier findings on data quality in cases of irregularity and fraud communicated to the Commission have been already presented to OLAF staff in March and June 2002.

All data mining and data exploratory work in cases of irregularity or fraud has been done by using commercially available statistical software. However, in the course of an extensive data mining exercise, a relatively small number of tasks have to be carried out repeatedly on different data sets or with different program parameters. Hence, for increased efficiency in carrying out analysis work, for convenience in maintenance of methods implemented in software, and for friendly accessibility and use by others than methods’ developers, the project team has sought to develop a library of macros of wide applicability and frequent use when data mining large databases. Equally important to the convenient accessibility to statistical data mining tools, is the representation of results in formats that can be easily read or browsed or entered into documents for reporting etc.

Procedures that have already been implemented for convenient accessibility allow

- the production of data dictionaries for variables under analysis, with various filtering capabilities,
- the compilation and multi-way classification of descriptive statistics, for a database,
- tabulations of string comparisons, and
- the extraction of signals in cross-classifications of counts of categorical variables or aggregates of continuous variables.

This work is conceived as leading to the construction of a software accessory that will be running on large databases.

In 2002, work for Advanced Statistics for the Clearance of Accounts comprised data collection, storage and analysis of relevant audit data. In order to develop Bayesian estimators for overpayment, the project team investigated three data sources that were expected to be reservoirs of prior knowledge; Court of Auditors data obtained in the annual DAS exercises, annual reports of Certifying Bodies, and corrections imposed by a Commission compliance clearance decisions.

Data from the 1999 DAS exercise have been merged into a database and analyzed. Methodological issues pertaining to the separation of “known errors” from errors showing up in the sample audited in calculating estimates of overpayment have been highlighted and reported.

Sector		MS1		MS2		MS3			MS4			MS5			MS6	Total		
	BP4	98	99	96	97	96	97	98	99	97	98	99	96	97	98	99	99	
Animal Premiums	2120	0.6	0.5	1.9	2.0	0.7	1.4	0.0				0.1						0.7
	2121	0.8	0.8			0.8	2.0	0.0				5.7						1.0
	2122	0.5	0.5			4.6	1.7	1.3	0.0			0.1						1.0
	2124									0.8	0.8							0.8
	2125	1.0	1.0	0.9	0.8	0.8	1.0	0.2	0.0			0.0						0.4
	2128									0.5	0.5							0.5
	2133						*											
	2220												6.7	6.4	6.1	0.0		4.6
	2221												6.8	6.4	6.0	0.0		4.5
	3804					1.9												
Fruits & Vegetables	1513													1.3	1.4	1.4		1.4
Measures Agri-Env	5011									0.0	0.0							0.0
Oils and fats	1410												1.2	0.9				1.1
Public Storage	2011																*	*
	2012																*	*
	3150							0.1										0.1
Total		0.6	0.5	1.6	1.6	1.4	1.4	0.3	0.0	0.1	0.0	0.6	2.7	2.0	3.3	0.8		1.2

temporal data is to be ingested into a relational database, which will be used to retrieve the required statistics of the oil discharges in a geographical area and within a time interval of interest. This development of this software tool was completed and it is ready for being used.

The results obtained for the Mediterranean Sea in the previous year are now in the process of being completed and extended to other European Seas (i.e., the North Sea and the Baltic Sea). This work had to be interrupted in November after the Prestige Tanker Accident off the Galician Coast. Since then the JRC has provided technical assistance to the Civil Protection unit of DG Environment. The imagery was made available by the European Space Agency (ESA). This intensive monitoring

activity started right after the accident on 17 November 2002. Since then, ESA made available about 200 images both from ERS-2 and ENVISAT. All the ENVISAT images were acquired with the advanced SAR (ASAR) instrument in the wide swath mode. Note that the ENVISAT instruments are all still in the commissioning phase. Nevertheless, ESA considered this event as an environmental emergency and decided to release a significant number of ASAR images. Although there is a large number of images, no time series of image data is available over the same area. This is because the revisiting times for both missions are over one month, and furthermore, the extension of the monitored area is very large (i.e., the North and North West Coasts of Spain, and the West Coast of France).



TECHNOLOGIES FOR INCREASING
EFFICIENCY OF HUMANITARIAN AID
AND DEVELOPMENT ASSISTANCE

TECHNOLOGIES FOR INCREASING EFFICIENCY OF HUMANITARIAN AID AND DEVELOPMENT ASSISTANCE

The EU is the largest donor of external assistance in the world. External assistance takes up 9% of the EC's budget and comprises development assistance, humanitarian aid, food aid and cooperation with developing and third countries as well as with partner countries in Eastern Europe, central Asia and Western Balkan countries. Development and humanitarian assistance together constitute about 65% of the EC's external assistance budget and is the single largest budget item managed by the Commission.

The JRC is supporting the RELEX family in its objective to improve efficiency and effectiveness of EU humanitarian aid and development assistance programmes by providing the necessary decision support systems as well as timely and reliable information.

3.1 Information Support for Effective and Rapid External Action

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The main achievements in 2002 were the improvement of the information infrastructure, the Digital Map Archive (DMA), its extension to include new decision support tools and geo-spatial information, the comparison of traditional with innovative image classification techniques and change detection methods, and the investigation of their ability when applied to very high resolution (1-2m) commercial satellite imagery to discriminate post-crisis structural (e.g. houses and buildings) damage. Other related work which began in 2002 included reviewing traditional and innovative methodologies for conflict early warning (Al Khudhairi, 2003) and testing mobile devices in the field.

IPSC's DMA is a Web-based information infrastructure hosted at JRC-Ispra and is composed of two main components: data (referenced global and local geographical information) and system including databases and decision support tools. Through combining Web mapping technologies and geographically distributed databases, the DMA makes available geographical information and data for countries that are recipient of EU humanitarian aid and development assistance programmes. The DMA was improved notably throughout 2002, at the request of Commission Services (Relex, ECHO, and AIDCO) responsible for External Relations, in terms of geo-information content and decision support tools. The DMA's geo-information content was extended to improve its local raster (including satellite imagery) and vector datasets for specific regions within the Balkans, Israel, Iraq, Afghanistan, Kashmir and Lebanon. In addition, specialised e-maps were made available through the DMA for specific applications including mapping of flood extent in Mozambique, volcanic eruption in Goma, a refugee camp in Lukole, Tanzania (Giada et al, 2002), structural damage severity in former Yugoslav Republic of Macedonia and the Palestinian Territories, EU spending on humanitarian aid and development assistance including de-mining (Gemelli & Shepherd,

2002), and ECHO ranking of countries according to their needs assessment.



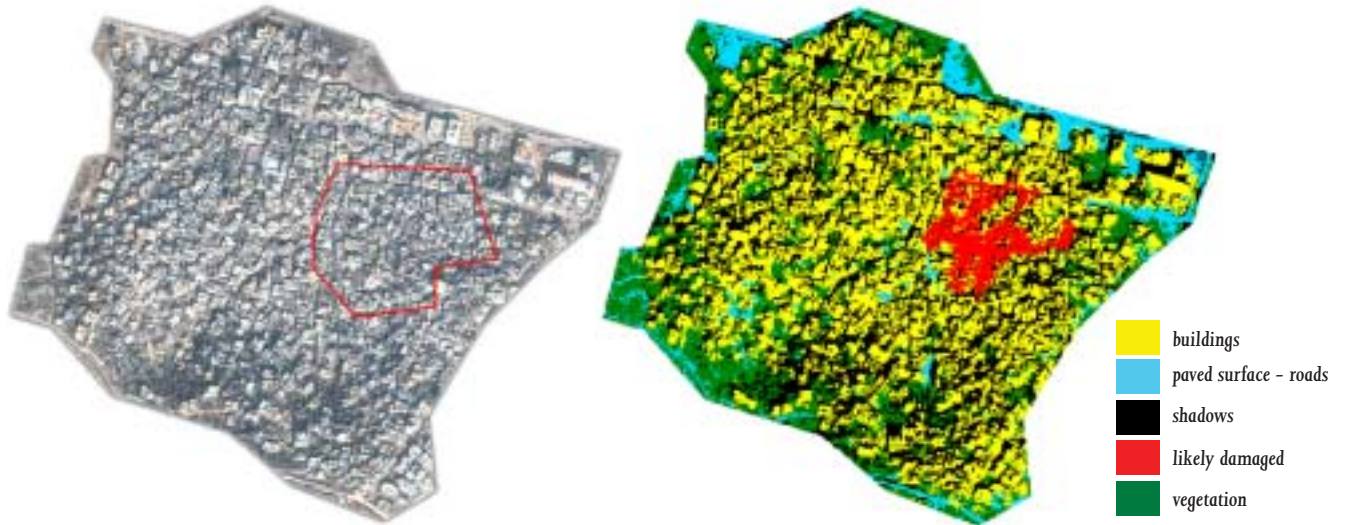
DMA earthquake map illustrating the likely population affected within 1, 2, 5, 10, 20 and 50 km radii from the epicentre of the earthquake of magnitude 6 which struck the region of Sumatra, Indonesia, at 7:56 am local time on 2 November 2002.

Earthquake and hurricane alert tools were integrated within the DMA to alert via e-mail registered users within hours of the occurrence of the disaster. The earthquake alert tool is operational and is providing pertinent information, such as location of the epicentre and likely affected population, through combining on-line seismological databases, web technologies and geo-spatial population analysis (De Groeve and Ehrlich, 2002). The service is used extensively by ECHO officers and United Nations' emergency relief agencies. In the near future, the service will be extended to include SMS messaging. The hurricane alert tool is pre-operational and will provide pertinent information such as current and predicted hurricane trajectory, and likely affected area and population through combining Online hurricane information (e.g. location and intensity), Web technologies and geo-spatial population analysis.

In 2002, IPSC identified through a comparison of traditional and innovative, object-oriented, image classification techniques as well as change detection methods applied to 1m and 2m resolution commercial optical satellite imagery acquired over the former Yugoslav Re-

public of Macedonia and the Jenin refugee camp, the technical boundaries for detecting and mapping post-conflict structural damage (Al Khudhairi et al, 2002). The results indicated that a reasonable estimation of damage could be obtained using automatic algorithms for houses classified as severely damaged, even with the 2 metre resolution imagery. The work in 2003 will be extended to examine the use of radar data and morphology-based methods for automatic structural damage assessment.

Towards the end of 2002, the JRC began investigating the usefulness of mobile devices including PDAs, portable computers, and satellite phones in the field. The devices are currently being tested by an officer from DG Relex who is on a 6 months field-based sensitive mission in Afghanistan. The experiment will be widened in 2003 to include officers on field-based missions in other countries.



Damage map of the Jenin refugee camp derived using very high resolution (2m) satellite imagery, change detection methods, object-oriented image classification (e-Cognition), morphological methods, and GIS.

Left: pre-conflict (May 2001) 2m resolution Ikonos image of the Jenin refugee camp.

The combat zone in the refugee camp that was systematically targeted by the Israeli Defence Force for several days during April 2002 is outlined in red.

Right: satellite-derived damage map of the Jenin refugee camp. Likely damaged zone is highlighted in red.

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3.2 Humanitarian Demining

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IPSC has been active during the reporting period in bridging the gap between technology offer and policy needs as an independent provider of scientific and technical reference in the fields of humanitarian security, specifically in humanitarian mine clearance. A number of concrete examples are reported here.

Standards

Mandated by the European Standardization Committee (CEN) and the Board of Directors of the International Test and Evaluation Programme for Humanitarian Demining (ITEP), the JRC launched a CEN Workshop process aiming to produce guidelines, principles and testing procedures for the metal detectors used in humanitarian demining. Supporting experimental measurements have provided the basis for some of the new tests included. The demanding process has involved manufacturers, users of metal detectors, as well as researchers in related fields. It has been well co-ordinated and formalised with the United Nations, responsible for the establishment and maintenance of the International Mine Actions Standards (IMAS). The CEN Workshop Agreement - the standardization document - was nearing completion at year-end and will be published before Easter 2003.

Tests

- Minetest
A compendium of reports documenting the successful test and evaluation projects, executed at the facilities in Ispra since 1997 was published, widely distributed

to the demining community (donors, industry & mine action centres) and meanwhile well appreciated.

- Assistance to UN test of metal detectors
The stock of metal detectors used by UN deminers was destroyed during the conflict in Afghanistan, necessitating a rapid field test to select suitable replacements. Prior to the trial, experts in testing received a training in metal detector test and evaluation at the JRC and the JRC supported the in-field trials as well.
- Multi-sensor Mine-signature (MsMs)
Results obtained from measurements made in the framework of the international, multi-partner MsMs campaign were processed and placed in the public domain through the MsMs web site. A substantial database has now been built up and the emphasis of this project is expected to shift more to data processing. Results of the MsMs project were also presented at the 2002 SPIE Aerosense conference.
- Optical and infrared (IR) domain
The work concentrated on a series of experiments to investigate the heat flow disturbances caused by the presence of buried anti-personnel mine surrogates in the thermal IR domain. The results will be used to support mine clearance in Lebanon.

Exploratory Research

The Humanitarian Security Unit has recently concluded a 2-year exploratory research project in which the aim was to enhance the Nuclear Quadrupole Resonance (NQR, a radio frequency resonance technique) signature of TNT explosives. A laboratory demonstrator is in its final stages of development and will be tested early in 2003.



Support to ITEP activity

Support

- International Test and Evaluation Program for Humanitarian Demining (ITEP)
The JRC sustained ITEP through the administrative support of its Secretariat, management of its web site, the participation to the Executive Committee and Board of Director meetings as well as participation to joint trials.
- Demining Technologies Information Forum (DTIF)
The JRC hosted last September, the third DTIF workshop on Ground Penetrating Radar (GPR) in support of humanitarian demining. Ways to accelerate the practical application of GPR technology to humanitarian mine clearance were identified and will be implemented.

Mapping

In support to the demining activities, an effective mapping team was set up. In 2002, it carried out the high-resolution mapping of Afghanistan through an ambitious program launched by DG RELEX within the Rapid Reaction Mechanism – see highlight section, page 10. On this experience, the Unit was given the lead to pursue further important mapping projects regarding other crisis areas.

Humanitarian Security

The Minister of Foreign Affairs of Sweden, Anna Lindh, invited senior level experts from security policy and research institutions in Europe, Canada, Russia and the United States to address the issue during a Workshop on Science and Technology in Support of European Security that was held from 24-26 April 2002 in Stockholm. The results of the Workshop are published in printed form and on the web, and includes the papers presented as well as a Rapporteur's Report of the proceedings. This Workshop is an important step in the process of applying science and technology to enhance security in our society.

A Workshop on Security of Container Commerce was arranged by RAND Europe, facilitated by the JRC and some 25 experts from Europe and the US participated. The findings and recommendations for further actions are documented and published. The JRC reported about the outcome to the Commission' inter-service group on maritime security. Based on these findings, members of this Commission group are discussing a number of concrete actions as follow up.

3.3 Food Security

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In many regions of the world, daily access to food is not guaranteed to a large fraction of the people. According to the latest FAO report on the 'State of Food Insecurity in the World' (SOFI 2002, see http://www.fao.org/sof/sofi/index_en.htm/), some 840 million people were undernourished worldwide in 1998–2000. The reasons behind this situation are numerous and diverse, including violent conflicts, civil strife, bad governance, natural disasters, high demographic pressure, natural resources degradation and adverse climatic conditions. Since the seventies and the dramatic drought years in the Sahel, the international community and the countries concerned have put a large effort in organising and implementing early warning systems for food security, in order to have early information on the situation and being able to react in time. The European Union has been an active player in this process through its Food Security and Food Aid policy, lead by DG Development and EuropeAid Co-operation Office (AIDCO).



MARS-FOOD supports the European Food Security and Food Aid Policy through improved assessment of the crop status in regions / countries stricken by food shortage problems.

In order to be able to intervene in the most adapted way, in particular to decide upon sending or not food aid, and to identify the size and localization of the possible deficit, improved information on the local crop prospects is needed. IPSC is working on that. It has developed a number of new methods and experimental bulletins for four pilot areas in the world, namely the Horn of Africa, Russia and Central Asia, the Mediterranean Basin and South-America. Methods developed are based on data captured by the Spot-VEGETATION satellite instrument and the outputs of the Global Meteorological Model of the European Centre for Medium range

weather Forecast (ECMWF). Developments include the integration with land cover information and crop profile assessment for Somalia, the adaptation of the European Crop Growth Monitoring System to Russia and the Mediterranean, the integration of the FAO water balance and agro-ecological zoning in the Horn of Africa. Experimental bulletins are produced, according to needs, on a ten-daily to bi-monthly basis. They can be consulted at

<ftp://mars.jrc.it/bulletin/>

At the same time, IPSC is playing an important role in international networking and exchange. In the development world more than in any other field, each Euro or dollar spent has to be spent in an efficient way. It is thus essential to articulate IPSC's activities with other international on-going programmes. This has been done in particular with the signing of a collaboration

agreement with the Food and Agriculture Organization of the United Nations (FAO), which has an international mandate for food security and an established cooperation with the EU in this field. This is also done with the organization, together with the FAO, of regional networks for crop monitoring for food security, first in South America (Cordoba workshop, November 2002, see <http://marsunit.jrc.it/SouthAmerica/>) and then in Africa (Nairobi workshop, January 2003, see <http://marsunit.jrc.it/Africa/>). These networks brings together all international players in the field, from Europe, from the region, from the UN agencies, from the US, and sets up a number of action points to improve the overall knowledge about crop prospects in food-insecure areas. Another workshop is schedule for the end of 2003 in Moscow, to cover Russia and the Commonwealth of Independent States.



TECHNOLOGIES FOR RESPONDING TO
CYBERSECURITY THREATS AND FOR
SYSTEMATIC WEB INTELLIGENCE GATHERING

TECHNOLOGIES FOR RESPONDING TO CYBERSECURITY THREATS AND FOR SYSTEMATIC WEB INTELLIGENCE GATHERING

The ubiquitous use of IT is overwhelmingly a benefit for society. The explosive worldwide growth of the Internet, its vulnerabilities and the lack of clear legal rules in e-commerce have raised a legitimate concern with respect to the adequacy of security and consumer protection measures

4.1 Cybersecurity

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The mission of the Institute aims at improving the protection of the European citizen against economic and technological risk. These risks assume particular importance in the on-line environment, both in their own right and because they threaten to erode citizens' trust and confidence in electronic transactions; without this trust and confidence it will be difficult to achieve the declared aim of the European Union "to become the most competitive and dynamic knowledge-based economy in the world"*.

In several of the domains defined below, an important focus of IPSC work during the period covered by this report was the drawing-up of "Research and Development Roadmaps", defining, in consultation with a wide range of stake-holders, the R&D challenges of the domain to be faced in the short, medium, and long term. Since this work represented an important input into the European Research Area, and the FP6 programme and project planning process, preliminary versions of these roadmaps were made available in early 2003. Definitive versions of the roadmaps are to be produced by summer 2003, but IPSC expects to continue to keep these up-to-date within an on-line knowledge base, as part of its

services to Commission policies and to the EU R&D community. A preliminary version of the AMSD roadmap is available at

<http://www.am-sd.org>

Privacy and Personal Data

With the wide deployment of large-scale IT systems, concern about the use of personal data has become widespread in Europe. This concern has led to the development of a comprehensive legal framework, in particular the 1995 and 2002 Data Protection Directives. Nevertheless, technical developments have not always proceeded in line with legal ones, and privacy abuses continue to be brought to public attention. IPSC took an active part in drawing up the RAPID roadmap of privacy and identity management, a preliminary version of which is available at

<http://www.ra-pid.org>

IPSC works on various aspects of technical developments for privacy protection, and two of these projects - DRIVE and P3P - are described in the "highlights" section.



Screenshot of the EEJNet pilot system developed by the JRC with general information sheets, database of dispute resolution bodies and the online complaint handling system.

* Lisbon European Council Presidency Conclusions, 23-24 March 2000



Consumer Protection

EEJNET (European Extra Judicial Network), the pilot development of which was launched by DG Sanco at the end of 2001 with technical support from IPSC, acts as a clearing house providing a single point of access to a large number of national and regional extra-judicial dispute handling services for EU consumers. IPSC also developed and tested OdrXML, a machine-readable language for dispute resolution documents, which will facilitate the automatic handling of some of the technical aspects of cross-border dispute resolution.

Combating Cybercrime

Not all the new opportunities opened by IT are for the good of society. Old crimes are being facilitated, and entirely new crimes developed, in the on-line world. Under the coordination of DG JAI, IPSC works along with Europol to monitor technical developments in computer criminality, and to analyse possible responses. At the end of 2002, IPSC launched an exploratory study into the phenomenon of "identity theft". While the name "identity theft" is much more widely used in the United States than in Europe, the phenomenon is already to be found in Europe, and appears set to grow rapidly.

IPSC also leads the CTOSE project, which aims at developing a methodology for handling electronic evidence. This project aims at ensuring that electronic evidence is handled in such a way that it can provide proof of events on a computer system sufficient for any tribunal, including criminal courts, which are in general the most exacting in their standards of proof. The project, which is due to finish in summer 2003, brought together a wide range of potential users from different communities - industry, commerce, system developers, law enforcement officers, and legal users of evidence - for a review meeting at Ispra in November 2002. The work to date was presented and reviewed, and the scenarios to be developed in the methodology demonstrator were defined.

Network Vulnerabilities

Computers and telecommunication networks are now pervasive, and this has created a new "information infrastructure" - primarily the Internet, but also telecommunications and other critical information networks. IPSC work to investigate and identify the systemic vulnerabilities created by this pervasive infrastructure continued over the period covered by this report.

4.2 Web Intelligence

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The web intelligence research over the past year has concentrated on developing new semantic methods of monitoring and classifying information published across targeted web sites. These new methods represent an advance on traditional web crawlers, generating intelligent metadata in XML from HTML pages.

Some of the initial research results in this area were developed in the competitive project European Treasury Browser (ETB) carried out in 2002. ETB exploits some emerging Semantic Web Technology and is based on RDF (Resource Description Framework). IPSC built the software infrastructure to link heterogeneous repositories of national educational resources across Europe. RDF proved to be the best framework to allow the exchange of metadata from different schemas. ETB allows multilingual searching and indexing of metadata through a new 1000 term thesaurus developed specially for the project. The software is fully multilingual, supporting Greek and Hebrew character encodings.

In January 2002, IPSC was asked by the Commission's Director of Communications to develop a "media monitoring" system. This followed encouraging results from a prototype developed within the research. In May 2002 this new "Europe Media Monitor" began operations. Since then a continuous R&D cycle has been undertaken, with rapid system upgrades. The result today is that EMM is well accepted within the Commission and many DG's are relying on it for policy monitoring and public feedback.

One of the major advances made by IPSC has been the invention of a real-time text analysis "state-machine". This software can process the text of a large article and identify the core subject of the article, based on patterns of predefined keywords. The software is able to process a page of text against 4000 keywords in less than 100 msec. Furthermore it is fully multilingual. This analysis drives EMM's real time alert system.

The application field for this "Web Intelligence" is broad and goes beyond simple news monitoring. Current projects involve monitoring contagious disease outbreaks, and risk indicators for civil unrest.

Knowledge Management

Good progress has been made in researching and developing methods for Web based collaboration and Communication. The GIST toolkit for rapid development of interactive information systems, has been upgraded to be more intuitive and better integrated with other Commission systems. The sector built the Project

Knowledge System (PKS) (<http://projects.jrc.cec.eu.int>) and the Project Tracking Archive (PTA) (<http://pta.jrc.cec.eu.int>) systems using GIST. PKS is the platform for preparing, discussing and disseminating the JRC work programme. PTA is the day-to-day tool for managing activities across an institute's projects. Both systems are in heavy use. GIST is available as open source software at

<http://gist.jrc.it>

STRESA (<http://lunar.jrc.it/StresaWebsite/>) is a Web accessible database to store documents and data coming from any type of plant or experimental facility as well as from code calculations. It is used both internally in the JRC and external research organizations. During the past year it was now adapted to act also as a Project Management tool.

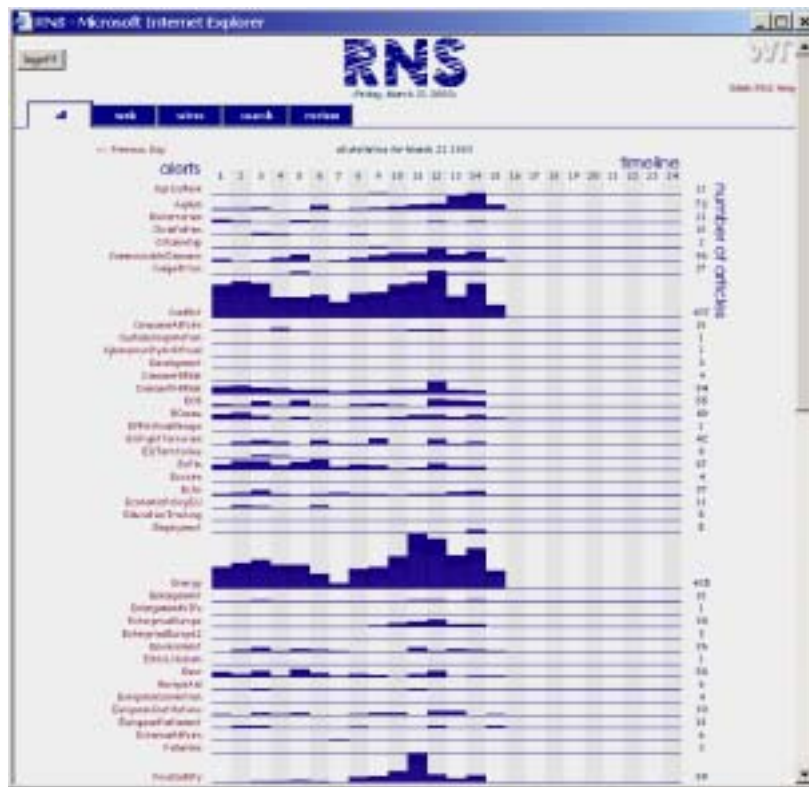
Honeypot Research Project

The objective of HONEYPOT is to develop and operate a hacker trap for network security. The purpose is to

study the attackers' activities and methods and evaluate the impact the findings have on legislation and law enforcement in this area. The goal is to understand the methods and tools used, the purpose of the intrusion and eventually to trace the activity back to the hacker himself. This knowledge is in turn useful for securing computers and networks and provides qualified information to advise policy-making and regulation in the area. This project was developed in 2002 and resulted in a successful reference implementation.

SODA (Solar Data Network)

IPSC has developed the middleware software, which connects data services on Solar Radiation data through a single portal. The data services are distributed across partner sites in Europe, yet are accessible through a single Web interface. SODA uses an XML based message passing system, which allows services to be self describing and to be combined into composite services. The user interface is generated automatically from the service description.



The Rapid News Service of EMM. The image shows the hourly statistics of articles received and categorized into the various Alert topics. This image was taken on March 21, 2003 during the second day of the Iraq conflict. All software and techniques developed by the Web Technologies sector, IPSC.

**ASSESSMENT AND MANAGEMENT OF
NATURAL AND TECHNOLOGICAL RISKS**



ASSESSMENT AND MANAGEMENT OF NATURAL AND TECHNOLOGICAL RISKS

IPSC has a long-established role in the management of risks. It provides the means by which the Commission implements the Seveso Directives, it is the hub of a European effort to assess how structures can resist earthquakes and other loadings and it has a growing role in transport – first for the development of a standard reporting system for aircraft incidents and secondly for better standards to improve the protection of individuals in road accidents.

5.1 Risk Analysis and Accident Reporting and Analysis for Technological and Natural Hazards

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During 2002 the efforts of IPSC were focused on

- Accident reporting and analysis, done at European scale and beyond, with the necessary independence from national and private interests and assuring that experience is shared among all Member States.
- Support to conception, preparation and implementation of European directives.
- Helping pre-accession countries to enter faster the “acquis communautaire” in fields reflecting pre-accession process priority needs.
- Methodological developments, validation and applications, also performed in the frame of large international projects (typically Shared Cost Actions) and of Third Party Works for national or regional authorities.

The relevant actions were:

1. The Major Accident Hazards Bureau (MAHB), mainly complying with the specific remit to give scientific and technical support to DG ENV in the formulation, implementation and monitoring of the “Seveso II” Directive (96/82/EC) and to help Accession countries to cope with the same Directive. It entails also follow-up actions which result after the occurrence of any major accident, including the formulation of amendments to the relevant legislation;
2. The Natural and Environmental Disaster Information Exchange System (NEDIES), supporting DG ENV, the Community action programmes on Civil Protection and the EU policies aiming at risk reduction. It develops and applies risk analysis methodologies and collects, validates and makes available information on natural disasters and technological disasters not falling under the Seveso Directive and not considered for its possible amendment;
3. The European Co-ordination Centre for Aviation Incident Reporting Systems (ECCAIRS), supporting DG TREN in its efforts to formulate a EU Directive on national event reporting systems and to assure effective risk management and prioritization of risk in civil aviation.

Major Accident Hazards Bureau

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All European countries are facing ever-increasing challenges from a wide range of disasters and emergencies, many arising from technological hazards. Hazards however, can be managed, and the combined efforts of government, industry and researchers are essential in developing risk reduction strategies. The Major Accident Hazards Bureau (MAHB) is a special service within the Institute devoted to fostering such research and technical exchanges within the European Union, and provides scientific and technical support to European policy in the area of major accident prevention, in particular the Seveso II Directive.

In order to fulfil its information exchange obligations towards the Member States, the Commission established the Major Accident Reporting System (MARS), the Seveso Plant Information System (SPIRS) and the Community Documentation Centre on Industrial Risks (CDCIR), all of which are managed and maintained by MAHB.

MAHB also manages the OECD and the UN/ECE accident reporting systems which makes it probably the world centre for major accident reporting, analysis and extracting lessons to be learnt. Accidents do still occur however, and the recent accidents in Enschede (NL) and Toulouse (F) illustrate that vigilance and further research is needed.

The accident in Toulouse was the most serious industrial accident that has occurred in Europe for over three quarters of a century. The accident claimed 30 lives, injured over 2000 people some seriously, and devastated an area of over 1 km in diameter in the city environs. The economic impact of the accident has still to be fully assessed but will be in the order of hundreds of millions of Euro. In response to this and other accidents and to the related resolution from the European Parliament MAHB has worked closely together with DG ENV to formulate an amendment to the Seveso II Directive that included the major concerns arising from these accidents. The International Workshop organised by MAHB and held in January 2002 on the safe storage and handling of ammonium nitrate made a significant contribution to this effort.

It has become apparent that a major concern is that of appropriate land-use planning and MAHB together with the French Competent Authority organised an International Conference in Lille, in February 2002, on the subject of "Major Accident Hazards in Land-use Planning".

An important conclusion resulting from this event was the agreement of the major stakeholders to reconvene the MAHB technical working group on land-use planning with the view of providing more understanding and transparency in the underpinning risk management process and to develop more prescriptive guidance, addressing in addition the problem of existing sites and the spread of urbanised regions. One significant advance will be the development of a technical database of commonly agreed accident scenarios and data that may be used in the risk/hazard assessments that will be developed and managed by MAHB.

The first meeting of the reconvened "European Expert Group on Land-Use Planning" in relation to the Seveso II Directive has been held on 9-12 September in Ispra. The terms of reference of this group and a provisional work programme was agreed upon at this meeting and presented at the CCA (Committee of Competent Authorities) meeting in October.



In parallel to this activity, the work of mapping all Seveso sites in Europe and the Candidate Countries using the GIS Seveso Plant Information Retrieval System (SPIRS) has continued and to date over 6000 establishments are in the system.

In order to promote good practice and seek a unified implementation of the Directive, MAHB and the DGENV have continued with their "Mutual Joint Visits Programme", organizing meetings in Sweden, Italy and Belgium. In order to promote efficient information exchange a dedicated website has been developed by MAHB for Member State inspectors.

The problem of the comparability of risk assessment methodologies and of their results for supporting decision makers has been further investigated. A dedicated international Workshop has been held on the 27-28

June 2002 in Arona, during which a position paper of the JRC on "Risk comparability and integrated risk assessment" has been discussed and agreed upon. It constitutes the base of the FP6 Institutional Action on the same subject.

Web site: <http://mahbsrv.jrc.it>

Major Accident Hazards Bureau for PECO Countries

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The main objective of the action is to support the Candidate Countries to comply with Seveso Directive obligations and to design and create compatible regional and national central information systems for the management of risk and emergency situations.

During the reporting year, a thorough survey was completed on hazard priorities in PECO countries, identifying risk relevance, priority actions and needs and present situations.

- Software Tools and Databases

With regard to the management and risk assessment of hazardous installations the SPIRS and MARS systems have been delivered to all Candidate countries and local training in their use has been given in 10 countries. This software is in the form of a distributed database and includes the basic GIS data for these countries but allows for locally developed GIS data to be interfaced, and some Candidate countries have during 2002 included information on their Seveso site into the system. The software can also be used to record and transmit information on major accidents to the central Major Accident Reporting System located and managed by the Major Accident Hazards Bureau (MAHB), an action which become mandatory on accession to the EU.

The software ARIPAR, for the analysis of area risk from technological hazards, originally developed jointly by the JRC, Snam Progetti, and the University of Bologna, has been further developed and translated into English and has been delivered to all Candidate countries.

Collection of existing data and information relative to hazardous installations and Seveso II implementation in PECO countries.

As envisioned in the project proposal the JRC also sought information that would allow it to assess the existing capabilities and needs of each PECO country in relation to information and risk management. It also sought comprehensive information on each country's progress in transposing and implementing the Directive. Together these two areas of knowledge

would form a basis for targeting future collaboration and exchanges relevant to the management of industrial risks.

Collaboration on Applied Research and Tools for Risk Assessment of Hazardous Installations. The JRC launched projects with both Poland and Slovenia in regard to risk assessment for hazardous installations.

The concluding seminar to this activity was held on 10-13 November 2002 in Ispra in which the project achievements were described and a concerted vision of the direction and shape of future collaborations between the JRC and PECO countries regarding hazards management in FP6 were discussed.

- Relevant Competitive Activities

In addition to the institutional activity a number of competitive activities have been pursued through 2002. These include the ACUTEX (Acute exposure threshold levels in the case of accidental release of substances), HARSNET, PRISM, SIMAGE, ARAMIS (Accidental Risk Assessment Methodology for Industries) and S2S projects.

Further detailed information of the work described in this section and much more can be obtained from the dedicated MAHB web site

<http://mahbsrv.jrc.it>

The Integrated System for Environmental Monitoring and Emergency Management (SIMAGE)

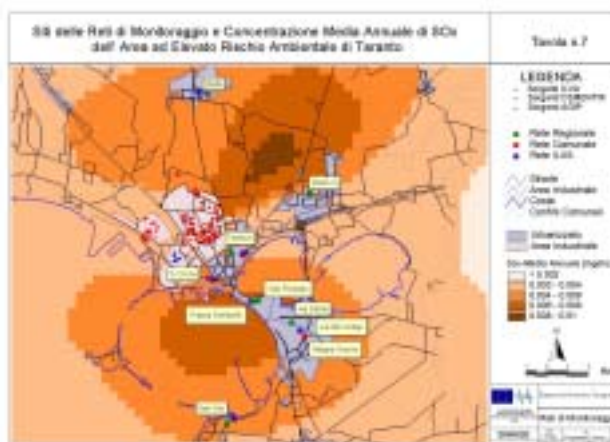
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The JRC continued to carry out the SIMAGE project, a Framework Agreement with the Italian Ministry for the Environment, on behalf of which JRC is managing all aspects of the design, realisation and installation in the provinces of Brindisi, Taranto and Porto Marghera (Venice) of an interoperable distributed system for air-quality monitoring, environmental data management, management of risks associated with industry and with the transportation of hazardous goods and the management of emergency situations. The Project is scheduled for completion by July 2004.

During the year the following milestones were achieved.

- The design of the future air quality monitoring networks of the industrial areas of Brindisi and Taranto was completed. The two new air-quality monitoring networks will integrate, optimise and complement, when necessary, the monitoring stations already existing locally. The design activity took into consideration the complexity of the decision making process related to spatial and urban planning activities

and environmental management of critical industrial areas.



SIMAGE project: A typical decision support diagram for identification of the monitoring area

- The overall hardware architecture of the monitoring system's data management and data elaboration centres were finalized. This final architecture includes, in particular, a dedicated distributed communication network using the MPLS (Multi-Packet-Layer-Switching) technology, the exploitation of a specific Data Warehouse kernel and tools for high-level data analyses, multi-dimensional data navigation and interactive web communication.
- The CommonGIS (Common Access to Geographically Referenced data – resulting from the Esprit project 28983) software was integrated into the software platform of SIMAGE. It will be used for the production of the SIMAGE Atlas, a snapshot of all types of information captured within the system and generated by its elaborating centres.
Web site: <http://commongis.jrc.it>
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- A large activity to collect data in the two provinces of Brindisi and Taranto was initiated. This data is expected to fill the SIMAGE databases and be used for environmental management and emergency management.
- The design of a generic architecture for the monitoring and control of the risk associated with the transportation of dangerous substances, primarily by roads, was completed. A call for tender for the realization and installation of a pilot system based of this architecture in the industrialized areas of Porto Marghera, Brindisi and Taranto was carried out. As a result of the tender, two concurrent technological implementations of the architecture will be compared during 2003.
- A contractual collaboration has been started with the regional environmental Authority of "Puglia", ARPAP,

for their validation and overall local management of the SIMAGE system. ARPAP has been designated as the major end-user of the SIMAGE deliverables. Fifteen ARPAP staff members will start to use the system one year before it is handed over formally.

Natural and Environmental Disaster Information Exchange System - NEDIES

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The main objectives of the NEDIES project are to collect, exchange, analyse and disseminate information and knowledge on the occurrence and management of natural disasters and technological (non Seveso) accidents. This information is primarily addressed to the European Commission civil protection services and to the organisations involved in disaster management and civil protection in EU Member States and Candidate Countries. Among the various activities of the NEDIES project, the production of lessons learnt reports from these disasters and accidents, and recommendations and guidelines to cope with them, play a major role. To facilitate the exchange of information between all actors involved in the management of disasters and accidents, the NEDIES project organises expert meetings and workshops and manages an interactive website:

<http://nedies.jrc.it>

In this period a number of studies and event analyses on specific types of disasters and on communication problems have been performed and reports published:

- Guidelines on flash flood prevention and mitigation.
- Lessons learnt from flood disasters,
- Lessons learnt from maritime disasters
- Dissemination of information on lessons learnt from disasters.

In addition, landslide hazard assessment was carried out using GIS techniques in the Potenza river catchment in central Italy and in the Tirajana basin, Gran Canaria Island, Spain.

Also in 2002, the NEDIES website underwent a major upgrade while the number of authorised experts having access to the password protected area of the website notably increased.

A number of international expert meetings and workshops were organised at Ispra. These included:

- Lessons learnt from landslide disasters, held in March,
- Lessons learnt from forest fire disasters, held in May,
- Dissemination on information on lessons learnt from disasters, held in June,
- Recommendations to deal with snow avalanches, held in July, and

- Lessons learnt from road transport accidents, in September.

In addition, a collaboration agreement was under negotiation with the United Nations' International Strategy for Disaster Reduction (UNISDR). The first phase of the collaborative project regards multi-risk analysis, in particular the analysis of natural disasters causing technological disasters and the domino effect of natural hazards.

Web site: <http://nedies.jrc.it>

NEDIES for PECO countries

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With regards to natural hazards, there is no legal act like the Seveso Directive that directly binds the PECO Countries with regards to the *acquis communautaire*. However, there are several programmes launched by the European Commission that indirectly require knowledge-sharing with the Accession Countries. It is for this reason that the NEDIES project was extended to PECO countries. In addition, the March 2001 dedicated seminar highlighted the risk relevance of natural hazards in the ten participating countries.

Specifically, the JRC targeted four main NEDIES activities for Candidate Country participation. These were:

- NEDIES expert meetings and workshops;
- the NEDIES disaster reporting system;
- the NEDIES clearing house of information in the field of natural disaster risk management; and
- data and information collection towards better understanding of disaster management and hazard priorities in candidate countries.

A specific meeting between the JRC and PECO countries, focusing on achievements and future collaboration within the project Management of Natural and Technological Hazards, was also organised together with the Major Accidents Hazards Bureau (MAHB) of the JRC in November.

European Co-ordination Centre for Aviation Incident Reporting Systems (ECCAIRS)

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The EU Directive on Occurrence Reporting in Civil Aviation, at the end of 2002, has reached the final stage in the adoption process. Member States will be requested to collect and exchange information on aviation incidents and accidents when the Directive enters into force. The objective of the Directive is to contribute to aviation safety through early detection of potentially hazardous situations in a secure, integrated, EU wide

collection of incident and accident (occurrences) reports.

The ECCAIRS reporting system, a set of tools developed by the Technological and Economic Risk Management Unit, and the related collaborative network, formed by most aviation authorities and accident investigation bureaus in the EU, anticipate the implementation of the Directive. In 2002 the ECCAIRS steering committee, at its annual meeting, adopted fully the data collection and integration methodology presented by the JRC as the foundation for European wide analysis of aviation safety information by the EU aviation authorities and/or accident investigation bureaus. The vast majority of these organisations are already using, or have decided to start using, the tools provided by the European Commission. Some others evaluate still what will be the most effective way for them to become part of the ECCAIRS network. During 2002 five of the candidate countries have taken a seat in the ECCAIRS steering committee and it is expected that during 2003 the others will follow.

Now that the issue of data-collection, -exchange and --integration has basically been resolved the national bodies have asked to address during 2003, within the scope of the ECCAIRS network, the analysis capabilities required to extract useful information from the data collected. The JRC will play also a key role in the definition of these requirements since their feasibility must be verified against the capabilities of the data-collection mechanisms and their implementation, for a significant part, will be co-ordinated and/or done by the JRC.



*Handover of ECCAIRS-4 reporting system to ICAO for adoption
(R. Menzel, W. Post - Montreal/Canada – ICAO premises)*

In 2002 the ECCAIRS tools have reached a wide acceptance also outside the domain of the EU authorities and investigation bodies. Most important element of this success is the decision by ICAO* to adopt the ECCAIRS-

4 reporting system as the next generation ADREP tool (Fig.). In 2002 the system has been installed in Montreal's ICAO Head Quarter and 30 years of ICAO reports has loaded in the new system. The obtained data-compatibility between ICAO and the Member State authorities and investigation bodies results in increased data-quality and significant cost savings at both sides. Furthermore authorities world-wide (a/o South Africa, Costa Rica, China) have shown their interest in ECCAIRS and are requesting, or already using, the ECCAIRS system. Because of its applicability for Air Traffic Management (ATM) related occurrences, ECCAIRS-4 is gaining ground in the ATM world, also thanks to a fruitful collaboration with Eurocontrol. As a spin-off activity of ECCAIRS the MEPHISTO conversion development platform has become a strategic tool for data exchange and integration in 2002. It has been adopted for data-conversion by many authorities in Europe, ICAO, Eurocontrol and NTSB.

It is expected that during 2003 the implementation of ECCAIRS will take place in many of the EU Member States (and others). In parallel the next phase of ECCAIRS, the selection, development and application of analysis tools will be started up in close collaboration with the national bodies, the Joint Aviation Authorities, ICAO and Eurocontrol.

A training action on ECCAIRS system and network and on the relevant Directive is planned for 2003 for the Candidate Countries.

In addition to the institutional activity a number of competitive activities have been pursued, focused on Human Factors analysis for safety analysis and training issues in the area of Aviation Maintenance.

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In particular the project AITRAM has completed the development of Virtual Reality based training courses for maintenance personnel, that merge technical and human factors issues, such as team work and leadership. The project ADAMS-2 has instead focused on the impact of human factors and maintenance programs on the overall design and cost benefit analysis of new generation aeroplanes. In both projects, the HF sector was responsible for modelling and simulation of human behaviour and for human reliability assessment.

Moreover, an intensive contribution has been given to the work of the internationally based Future Aviation Safety Team (FAST), sponsored by the JAA and FAA, on the identification of the most relevant Areas of Concern and relative Hazards derived from the design and development of "new generation aircrafts". HF is a critical safety issue in this environment.

* International Civil Aviation Organization, part of the United Nations

Methodological developments in Human Factors analysis have been pursued also in the automotive and marine transport sectors (EUCLIDE, THEMES, PRISM).

Further detailed information of the work described in this section and much more can be obtained from the dedicated web sites

<http://eccairs-www.jrc.it>
<http://humanfactors.jrc.it>

5.2 Construction and Earthquake Engineering

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In the framework of the projects on safety of structures under earthquake, traffic and wind loading, important results were achieved in four main topics: 1) Ordinary constructions (Buildings and Bridges); 2) Application of new materials for wind-mill towers, 3) Behaviour and modelling of Masonry; 4) Active, semi-active and passive systems and techniques for structures subjected to dynamic loading (earthquake, wind and traffic), and 5) Enhanced experimental methods.

Behaviour of precast industrial buildings

In the framework of the ECOLEADER activities, a project on the seismic behaviour of precast industrial buildings was activated. The objective of the project is to provide specific experimental evidence about seismic behaviour of precast one-storey frames for industrial buildings as compared with cast-in-situ analogous structures. The results are particularly important for the correct calibration of Eurocode 8 design rules. To this purpose two structural prototypes have been designed, both consisting of six columns connected by two lines of beams and an interposed slab. The connections between columns and beams are made with monolithic joints for the cast-in-situ arrangement and with hinged joints for the precast one. The pseudodynamic test on the precast structure has been performed in 2002. The seismic action has been simulated by an artificial accelerogram, compatible with the response spectrum type 1B of Eurocode 8. It has been applied three times for as many levels of peak acceleration, starting from $a_g = 0.36$ g and attaining up to $a_g = 0.72$ g and $a_g = 1.08$ g. The last level corresponds to about the expected ultimate capacity at collapse limit of the structure following a calculation based on Eurocode 8 rules.

The results have been used to validate the numerical models used in the project, and will be complemented by the results on the cast-in-situ prototype to be carried out in 2003.

Assessment and retrofit of RC bridges

Following the experimental assessment of existing RC bridges and the calibration of numerical models, the research activity of ELSA was concentrated on retrofitting solutions using high-strength composite materials. The techniques and guidelines proposed for FRP-strengthening of bridge piers have been reviewed. Probably the most attractive use of FRP in bridge retrofitting is jacketing of piers for increase in confinement and enhancement of ductility capacity. Experimental data and semi-empirical design equations are available in literature only for full circular or rectangular cross-sections. However, European highway bridges most often have piers with rectangular hollow cross-sections. Numerical simulation indicates that the existing constitutive laws and design equations cannot be simply extended to the case of hollow cross-sections. Results of non-linear 3D numerical analyses offer insight on the effect of jacketing on the concrete properties. On the basis of these results, further numerical studies have been performed in order to study the effectiveness and applicability of jacketing with FRP. Although certain limitations were identified, it was found that FRP jackets effectively increase the ductility capacity of existing bridge piers with hollow cross-section. The final task of the research comprises parametric analyses with the objective to propose simplified equations for the design of FRP jackets for rectangular hollow cross-sections.

Structural Reliability of Existing Underground Water Pipelines (SEISLINES)



Seismic tests on a portion of aqueduct lining were conducted as a part of the project Age-Variant Seismic. The tests were conducted on straight segments of asbestos cement pipes, embedded in a volume of dry sand of well-known mechanical properties. Each segment had two 3 m long pipe elements connected by a standard steel joint. Two segments were tested at the same time, one in virgin (undeteriorated) conditions, the other

having been chemically treated to reproduce the effects of the exposure to sulphate. A special chemical apparatus was designed and constructed for this scope.

The aim of the seismic tests was to obtain experimental information to be used in the assessment of the numerical models adopted for modelling the aqueduct lines, to highlight their eventual limitations, and to verify whether effects of corrosion on the global seismic behaviour exist.

The results proved that the effects of chemical attacks from sulphate are negligible, for the material of the pipes as well as for the global seismic behaviour of the pipeline.

The results of the test were used to verify the models used in the project and could represent a wealth of information against which more refined models could be calibrated or developed.

Testing of Composite Wind Turbine Towers

The aim of the MEGAWIND project is to design a new prototype Wind Turbine more suitable for installation in difficult locations such as mountainous terrains or shallow offshore coasts. The technical concepts will include adaptations to key components such as a split-blade system and new construction methods that will enable the tower to be deployed more easily. With this aim, the ELSA laboratory has designed a 50-metre tower manufactured from fibre-reinforced composite materials. It is expected that the use of composites and their associated manufacturing processes will result in a reduction of the logistic effort (mainly due to heavy transport and lifting equipment) that is usually required to assemble large wind turbines on difficult sites. Another benefit is the improved corrosion resistance compared to steel towers, especially in marine environments. ELSA has designed and tested two tower modules using combinations of composite and high-strength concrete materials. Given the size of the full-scale tower modules only third-scale elements were constructed and tested at the ELSA laboratory. The results were conducted using a sub-structuring technique whereby only the base of the tower; i.e. that part where the reaction moment is highest, is tested to destruction -the added torque effects of the missing top half being simulated by the action of two 100 ton pistons on either side.

The laboratory results indicate that both tower types can provide enough capacity to meet the design criteria: the main considerations being the avoidance of resonance effects and the strength needed to resist extreme hurricane winds. It is expected that, by the end of the project, a prototype full-scale tower will be manufactured and proof tested for certification.



One corollary of this project is that it highlights the need, both for the construction industry and materials manufacturers, to establish new construction codes at a EU-wide level that will enable the manufacture of structures using new materials, where none presently exist.

Masonry Structures and Protection of Built Cultural Heritage

In order to develop/calibrate advanced numerical models for the in-plane cyclic behaviour of masonry, the experimental programme initiated in 2001 has been continued. A new batch of masonry walls has been constructed early 2002 and part of them have been tested up to failure under different lateral loading histories: monotonic, cyclic symmetric and cyclic non symmetric. In particular, the experimental results under cyclic non symmetric loading histories constitute a valuable additional input for the development, calibration and/or assessment of existing/new numerical models. Indeed, such kind of experimental data are almost inexistent in the literature.

On the numerical side, a new global model able to reproduce the progressive strength/stiffness degradation of masonry panels submitted to in-plane cyclic loading has been implemented and calibrated against the different experimental results already available.

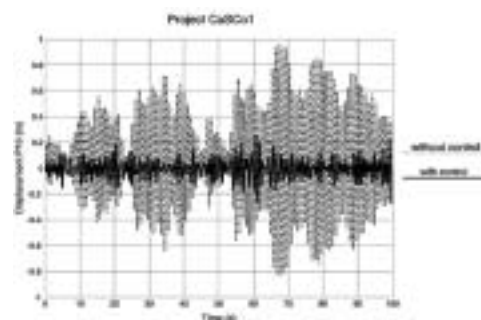
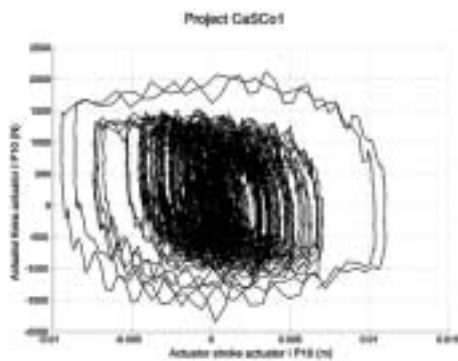
In the second year of the exploratory research project entitled "Integration of 3D Reconstruction and Seismic Analysis for Virtual Heritage and Cultural Conservation", more elaborate and robust image processing algorithms have been introduced and tested. Automatic mesh generation tools have also been developed in order to generate joint finite elements with finite thickness.

Active, Semi-active and Passive Systems and Techniques for Structures subjected to Dynamic Loading

The CASCO (Consistent semi-Active Structural Control) project, now in the final stage, investigates the per-

formance and effectiveness of semi-active devices for vibration damping in structures. The consortium includes as end-user the Austrian railways, their interest in the project being vibration and noise reduction in railway tunnels.

CASCO is a follow-up to the ACE project (Active control in Civil Engineering) executed under FP4 and focused on vibration damping in cable-stayed bridges. The large scale tests performed at ELSA under ACE showed promising results. Therefore the core group of Partners engaged in CASCO to investigate the Semi-Active technology, a vibration reduction approach based on devices requiring much less energy and easier to install and maintain. This makes the technology more acceptable by owners of large civil infrastructures.



The investigation is focused on the use of both oil and magneto-rheological semi-active devices. The latter are based on variation of fluid density – and thus, of damp-

ing properties - through application of a magnetic field. The oil devices were tested on the ACE/CASCO1 setup while the magneto-rheological ones are under testing on the CASCO2 mock-up consisting of a long R/C slab representative of the railway support in tunnels.

The first results obtained are very promising. The idea is to distribute along the slabs supporting the railway a certain number of miniaturized devices to damp vibration and reduce noise in tunnels.

The CASCO3 mock-up is an old bridge section dismantled in Austria and brought to JRC-ELSA. Vibration tests have been performed on it and additional damping tests will be made shortly.

Advances in Pseudo-Dynamic (PSD) Testing and Measuring Techniques

In 2001 ELSA had performed successfully PSD tests with non-linear substructuring on a large-scale model of an existing bridge and made the first steps towards 'tele-operation of experiments'. In 2002 the efforts were concentrated on the development of the the Continuous PSD testing method and Fast PSD testing method, which allow for a more accurate representation of the strain rate effects and avoid possible force relaxation during the execution of the tests. Also, important progress was made on optical/digital measuring systems, which are deemed to replace the traditional analogic devices. The work is based on photogrammetry techniques and already allows for replacing conventional devices in quasi-static tests with several advantages including full field deformation measurements.

Marie Curie Training Site ENTREE

Since October 2000, ELSA is recognised as a Marie Curie Training Site (FP5 programme: Improving Human Potential) for Experimental and Numerical Training in Structural Dynamics and Earthquake Engineering (ENTREE). During 2002, three doctoral fellows have been hosted within this framework: until March, a Polish fellow has been working for nine months on damage assessment of structures through dynamic identification techniques; from March to November, a German fellow has been investigating hysteretic devices for the passive control of structures; since November, another Polish fellow is working on identification techniques for detect, locate and assess damage in civil engineering structures (12 month stay). To date, 50% of the fellow-months awarded have been spent and a further 40% are already committed for three other doctoral fellows (from Romania, Spain and Germany) who are expected to arrive during 2003.

5.3 Structural Safety of Means of Transport under Fast Transients

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The project has aimed at validating the safety of various structural systems under transient dynamic loading, such as crash, impact, blast or explosion. Transport structures, energy production and industrial plants are considered. The activity has involved the integrated use of Computational Mechanics methods for theoretical prediction and of precision experiments at the Large Dynamic Test Facility and of the Dynamic Material Properties Laboratory. The project addresses policy issues related to prenormative and standardization Commission actions, such as: crash worthiness of vehicles for occupants, pedestrian protection (normative action under preparation), safety of road equipment, safety of industrial installations against accidents (explosions, impact), structural aspects of nuclear safety.

Transport Passive Safety

Research in 2002 has continued in the area of characterisation of structural and material behaviour under impact conditions for the assessment of energy absorption through structural deformation. Particular attention has been given to aluminium foams, which are low density and low impedance materials and show promising capabilities in automotive industry applications. An in-house dynamic compression testing machine has been devised, based on Hopkinson bar techniques, and this has allowed relatively big specimens of this material (of representative volume) to be successfully tested, Fig.1. In this work, which has evolved from an exploratory research project, close interaction with the Norwegian University of Science and Technology has taken place, especially in the validation of the constitutive relations and their implementation in Finite Element codes.

The activity in support of the formulation of the new normative action on pedestrian protection has also been pursued. The issue concerns the pedestrian friendliness of car fronts. Developments and the possible participation of the JRC as a member of a Monitoring Committee, as suggested by the European Parliament, have been followed. This committee would be set up by the Commission in order to monitor the implementation and collect feedback about the relevant technical provisions, and it would also include representatives of the automobile industry and consumer associations. The matter is presently in full legislative development at the Commission level, no Monitoring Committee has been constituted yet, and the JRC maintains contacts with DG-ENTR.

A few precision impact tests with real size components of road safety barriers using the Large Dynamic Test Facility have been prepared for the validation of relevant FEM codes predictions. The activity has been carried out within the competitive action project SAFEWAY, where particular emphasis is placed on biomechanical aspects. Materials and proper road barrier geometries causing reduced injury levels to the vehicle passengers are being sought and tested.

Interesting interaction with the European Vehicle Passive Safety Network 2 (EVPSN2), has started towards the end of 2002. This is an existing Thematic Network numbering approximately 45 members, and collaboration with it in specific fields is explored.

Numerical Simulations and Safety of Installations

The development of EUROPLEXUS, a large computational tool jointly developed by CEA and JRC for the simulation of complex fast transient dynamic events via explicit time-integration schemes, has progressed along the following main lines:

- Enhancement of the functionality of the JRC mirror site.
- Finalization of a new model for Fluid-Structure Interactions with incompatible interfaces, Fig.2.
- Advances in contact-impact modeling by the pinball method.
- Publication of previous work on Spectral/Finite Element coupling.

A significant effort in 2002 was also devoted to developments co-financed by EDF. These concerned mainly the new Domain Decomposition technique recently implemented in the code, which allows complex 3D problems to be subdivided into a number of sub-domains, each of which is solved by the most suitable time integration procedure, and possibly on a different computer on the network. In the same framework, the "liaisons" models (links between degrees of freedom) in EUROPLEXUS are being revised.

Finally, after a long period of preparation and negotiation, an collaborative agreement (Contrat de Licence et de Collaboration pour le Développement et la Commercialisation d'un code de Calcul dans le Domaine de la Dynamique Rapide) was signed between CEA, JRC (owners of EUROPLEXUS) and Samtech SA (a Belgian SME, a European leader in engineering software). This initiative aims at:

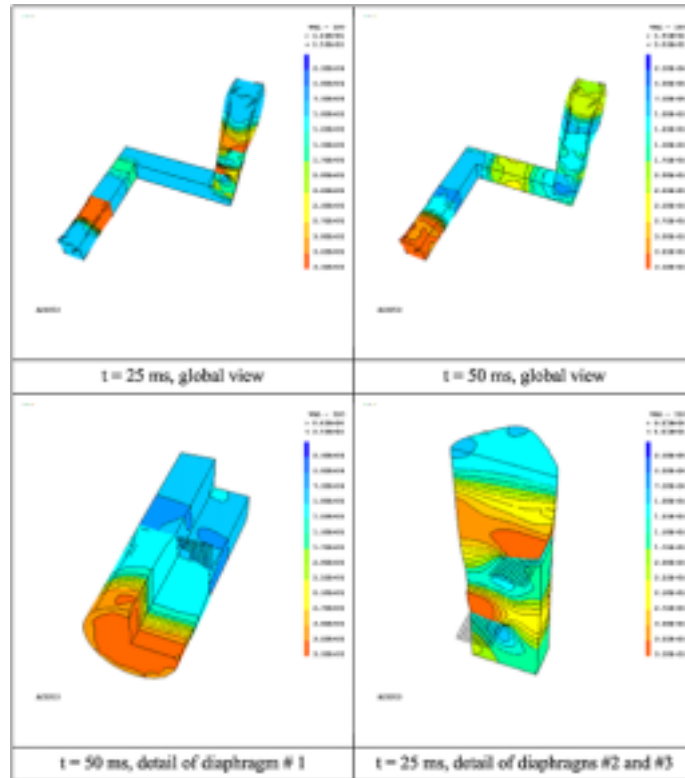
- The commercialization of EUROPLEXUS and its industrialization by means of interfacing with state-of-the-art pre- and post-processing tools of industrial quality.
- The set-up of a Consortium around EUROPLEXUS, into which a number of partners from the European Industry and major Research institutions, are invited to invest into further development of the code.



Aluminium foam specimens of very low and of higher density (cylinders of 50mm diameter and 50mm and 25mm height).

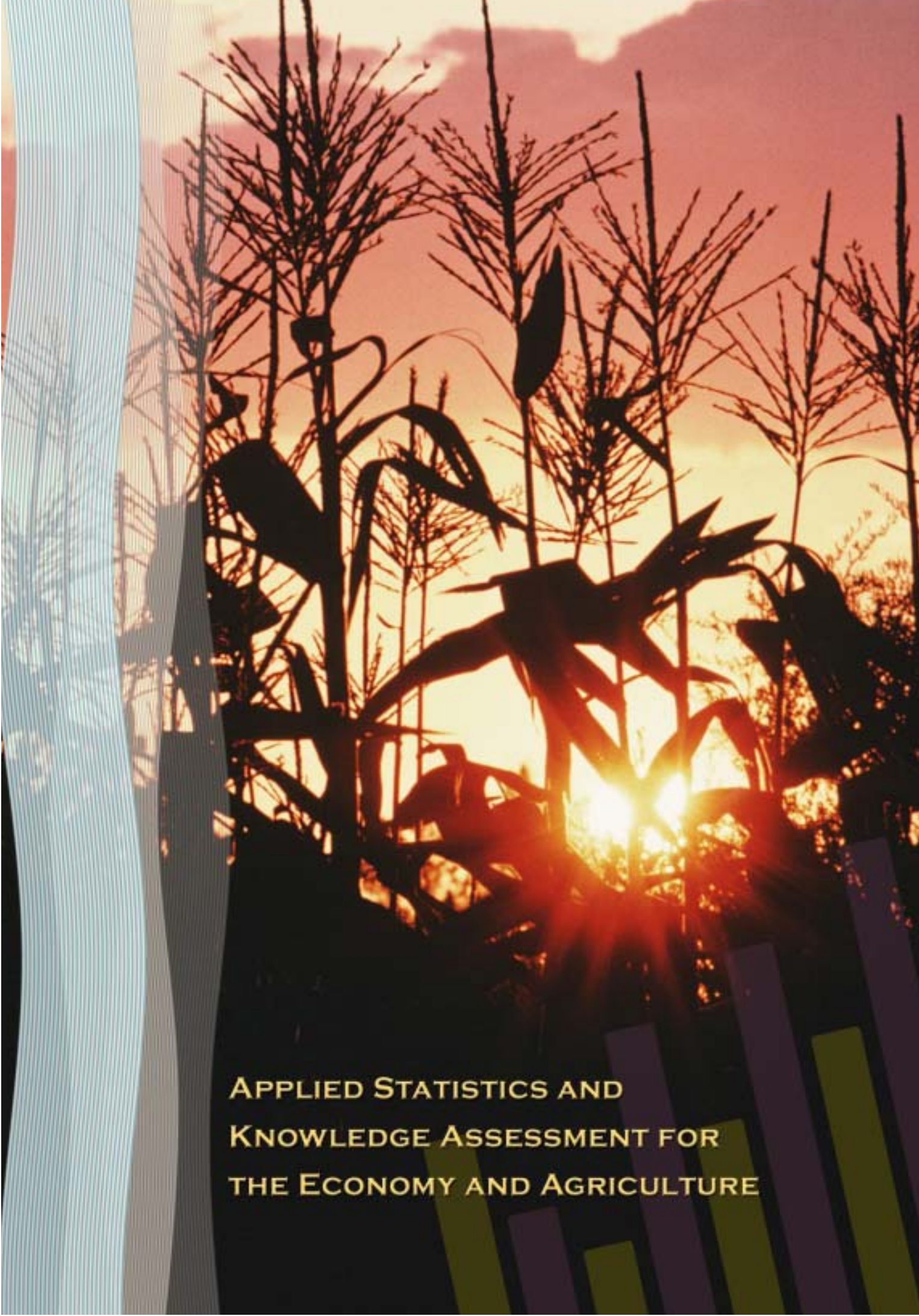
Concerning the safety of installations in the nuclear field, a testing campaign of ferritic steel has been performed within the project LISSAC: "Limit Strains for Severe Accident Conditions", where 11 other partners have participated. Specimens of several sizes and geometries have been dynamically tested at the JRC, whereas supporting modeling has been developed by the other groups. The project was completed in Jan. 2003.

EUROPLEXUS simulation of multiple explosions in a deformable 3D labyrinth. Intensity of pressure waves on the deformed structure are shown.



Further Reading

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- F. CASADEI, J.P. HALLEUX, H. BUNG, M. LEPAREUX: Organisation of the EUROPLEXUS Mirror Site (MS Windows) at JRC Ispra - Second Edition, Technical Note N. I.02.03, January 2002.
- F. CASADEI: Permanent Fluid-Structure Interactions with Incompatible Interfaces, Technical Note N. I.02.27, March 2002.
- F. CASADEI: A Hierarchic Pinball Method for Contact-Impact in Fast Transient Dynamics, presented at the 'VI Congresso Nazionale della Società Italiana di Matematica Applicata e Industriale' (SIMAI 2002), Chia (Cagliari), Italy, 27-31 May 2002.
- F. CASADEI, E. GABELLINI, G. FOTÍA, F. MAGGIO, A. QUARTERONI: "A Mortar Spectral/Finite Element Method for Complex 2D and 3D Elastodynamic Problems", Computer Methods in Applied Mechanics and Engineering, Vol. 191/45, pp. 5119-5148, November 2002.
- F. CASADEI: Time Step Management in the EUROPLEXUS Domain Decomposition Prototype, Technical Note N. I.02.108, November 2002.
- F. CASADEI: Domain Decomposition Prototype in EUROPLEXUS: An Evaluation of the Data Structure and Implementation, Technical Note N. I.02.106, November 2002.
- F. CASADEI: A Revision of the Liaisons Model in EUROPLEXUS for Domain Decomposition Calculations, Technical Note N. I.02.107, November 2002.
- F. CASADEI: Final Report Relative to the Collaboration Agreement Between the European Community and EDF/R&D - JRC Ref. N. 18921-2001-12 T1FS ISP FR, Technical Note I.02.105, November 2002.



**APPLIED STATISTICS AND
KNOWLEDGE ASSESSMENT FOR
THE ECONOMY AND AGRICULTURE**

APPLIED STATISTICS AND KNOWLEDGE ASSESSMENT FOR THE ECONOMY AND AGRICULTURE

IPSC promotes the use of modern statistics, econometrics and knowledge assessment methodologies at the direct service of EU policies in all areas where statistical analysis, statistical modelling and information appraisal are needed in the context of socio-economic and environmental policies. Typical applications include: the development of tools for short term economic analysis; the underpinning statistical work needed for macro-economic modelling; the use of statistical indicators and their quality assessment for socio economic and environmental applications; the methodologies for quality assessment for the information that feeds into the policy process, including the structuring of debates on the recurrence to the precautionary principle and the methodologies for participatory approaches to governance issues; the financial econometric work underpinning the Commission efforts toward the single market.



6.1 Increasing the role of the JRC in supporting the economic and financial policies of the EU

Web site: www.jrc.cec.eu.int/uasa
Contact: andrea.saltelli@jrc.it

The IPSC activity of statistics and econometric tools for economic analysis became in 2002 a full-fledged action line in the JRC work-programme, due in part to the support received from the main institutional customers of this activity: DG ECFIN and DG MARKT. Four lines of activity compose the action:

1. To perform macroeconomic modelling work in support to the Commission model QUEST II used by DG ECFIN to gauge the status of the economy of the EU and Candidate Countries.
Contact: riccardo.girardi@jrc.it
2. To develop tools for business cycle analysis and contribute to the development of short term indicators of the state of the economy.
Contact: christophe.planas@jrc.it
3. To perform specific work on socio-economic indicators (with initial focus on internal market and knowledge economy indicators), combining formal (such as sensitivity, institutional and multi-criteria analyses) and informal methods (e.g. participatory).
Contact: stafano.tarantola@jrc.it
4. To use financial econometrics in support to the single market initiatives, in particular the single market for capitals and financial services (initial focus on the Capital Adequacy Directive (CAD)).
Contact: francesca.campolongo@jrc.it

The appetite of the Commission services for this kind of quantitative analytic services is growing, both from the “old” customers (DG ECFIN, DG MARKT) and “new” ones (DG EMPL, DG ENTR), and highlights for 2002 are very encouraging:

- A tri-partite collaboration was established linking the JRC, DG MARKT and the European Investment Bank on themes of research on financial econometrics.
- JRC became an active member of the Structural Indicators Working Group (a key actor of the EU Spring Reports).
- DG MARKT published in November 2002 the 11th issue of the internal market scoreboard (a key EU publication) acknowledging JRC support. This line of work is developing into the construction of measures of Internal Market achievement, in collaboration with the sector of Knowledge Assessment Methodologies.
Web site: http://europa.eu.int/comm/internal_market/en/update/score/score11/score11-text_en.pdf
- DG ECFIN commissioned to JRC a detailed review of methodologies for building composite indicators, delivered in fall 2002 and mentioned in DG ECFIN Communication on structural indicators*.



- An ad-hoc software for output gap and NAIRU** estimation based on modern econometrics was prepared by JRC for DG ECFIN. DG ECFIN recommended its use

* “Communication of the Commission on Structural indicators”, DG ECFIN, Brussels, 16.10.2002, COM(2002) 551 final.

** NAIRU: Non Accelerating Inflation Rate of Unemployment – both output gap and NAIRU help to define the position of the economy relative to the economic cycle.

to member countries within the Economic Policy Committee of the EU. The software BUSY for business cycle analysis, developed by a consortium led by JRC, was likewise adopted by ECFIN, and tested in several Member States.

- A few articles on sensitivity analysis were published in good disciplinary journals, including the Journal of American Statistical Communications and Computer Physics Communications. A “primer” on Sensitivity Analysis was almost completed, and will appear as a book.



In co-operation with the UK Institute for Social and Economic Research, the National Bank of Belgium, the Economic Research Institute DIW in Berlin and the Italian statistical office, the JRC has finished the development of the FLASH software for rapid estimate of EU zone Member States quarterly Gross Domestic Product. The family of BUSY, FLASH and Program GAP products are now available for Commission Services, Member States and EU and Accession Countries, to become part of statistical production systems.



6.2 TIDDD : ICT for Governance

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A new concept-tool has been designed, developed and tested for communicating scientific information in non-specialists contexts: TIDDD or TID3 (‘Tools to Inform Debates, Dialogues & Deliberations’, ©European Communities 2002-2003).

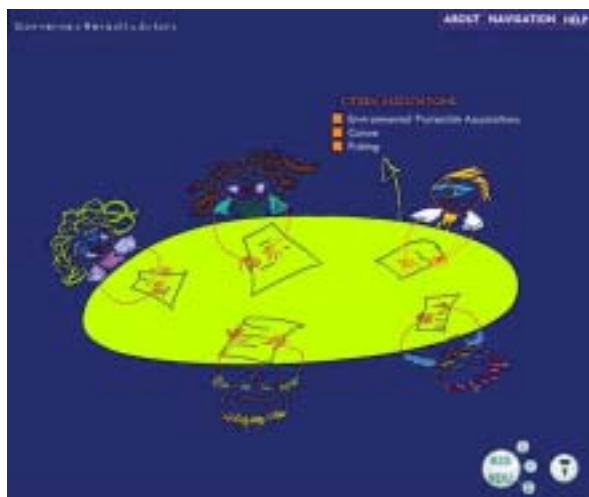
TIDDD deploys new ICT (Internet, multi-media and 3D virtual reality interfaces) in order to organise the information used in a dialogue process about a governance issue, and is specifically tailored to support participatory processes. The design and deployment of these types of tools is based on the experience of integrated assessment and more traditional DSS (decision support system) activities.

The work has been done in the context of projects like GAS – ©European Communities 2000-2003 – and the GOUVERNe and VIRTUALIS shared-cost actions. All the relevant information can be found at:

- <http://alba.jrc.it/gas> (EUR 19949 EN)
- <http://alba.jrc.it/gouverne>
- <http://alba.jrc.it/virtualis>

Over recent years, the role of decision tools has developed not only because of technological advances but also because of the greater awareness and skill in the actual use of such tools. In a sense, this enhanced role has assisted a change of function for decision tools within environmental decision-making processes. Moreover, there has also been an increased recognition that it is not at the level of decisions that appropriate consultation, dialogue and deliberation takes place. Emerging, more accountable and inclusive governance styles abandoned the concept of a single, omnipotent decision maker, replacing it with extended processes involving debates on the relevant policy issues.

Information tools not only provide the available scientific knowledge base but also constitute the shared ground through which this debate is organised, integrating other sources of knowledge emerging during the process. These tools are an explicit contribution to the implementation of the science and governance initiatives, and are characterised by the principles of progressive disclosure and information quality assurance.



Snapshot from the TIDDD developed for the GOUVERNe SCA. Information about actors involved in groundwater planning in the middle valley of the Hérault river basin (France).

The principle of progressive information disclosure addresses also the problem of the information divide arising when the information available is not intelligible to all the actors in the process. This principle allows the tool to potentially play different roles within a partici-

patory process (education, social learning, debate, etc.).

A key design criterion is the emphasis on the quality of information (the information pedigree). A protocol to classify the quality of the information provided has been developed. It includes different levels of quality assurance, conducted by extended peer communities.



New interfaces developed for VIRTUALIS. The V GAS, a new version of GAS, being developed as a 3D game, aiming at education and general public debate about lifestyles and climate change.

6.3 MARS-STAT: Crop Yield Forecasting and Production Estimates

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According to its institutional role (Parliament-Council co-decision n. 1445/2000) MARS STAT provides independent analysis and forecasts on crop yield at European and national levels, in near real time to the Agriculture DG and EUROSTAT. The forecasts are produced running an agro-meteorological system* (MARS Crop Yield Forecasting System - MCFYS), which has been conceived and is continuously improved by IPSC. The main users are DG-Agriculture market analysts and Agriculture Statistics Member States delegates within the EUROSTAT working groups. During the period December 2002-February 2003 IPSC published eight agro-meteorological pan-European analyses and participated in four DG-AGRI Outlook analyses. IPSC participated and reported to the EUROSTAT working groups on Agriculture Statistics (Crop and Land Use) and was invited to report to the Agriculture Statistics Committee. As in

* Some numbers of the MCFYS system are: 94 printed bulletins from 1993 (7 bulletins in 2002); 35 countries covered; 28 years of meteo and agrometeo reference data base; 10 years of NOAA and SPOTVEGETATION satellite reference image; time series on 20 agro-meteorological crops indicators; 11 crops covered with area estimates (up to 1998) and yield estimates; real time agriculture monitoring web interface; CGMS (Crop Growth Monitoring System) software for spatial yield prediction over all of the territory.

2001 the analysis and forecasts produced by the MARS unit if IPSC were announced as the main source of information in this domain (benchmark) by the Agriculture DG analysts who used them in reporting to Fischer's Cabinet and as input in food balance sheet estimations (crop production part) unless first estimates or input from Member States are available and considered reliable. In addition in 2002 EUROSTAT announced as well the introduction of the MARS crop forecasts into their official crop forecast system.

The main Institutional deliverables in 2002 are available from:

- <http://mars.jrc.it/stats/bulletin> including all of the official printed MARS Bulletin and interim analysis.
- <http://www.marsop.info> includes all intermediate products and archives used for the analysis such as crop maps, crop indicators and meteorological maps back to 1975, NDVI maps based on Vegetation and NOAA-AVHRR back to 2000.

IPSC is committed to the research and development aspects related to the technological, scientific, thematic and communication improvement of the MCFYS. Within this context IPSC organised the first international Crop Growth Monitoring System workshop, whose output was the creation of a scientific CGMS-Expert Network. A web site for discussion and exchange of knowledge within the network was created:

<http://marsunit.jrc.it/cgms/>

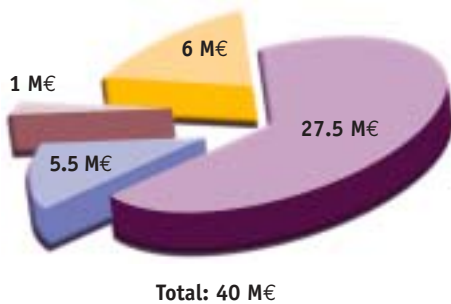
In 2002 the MARS crop yield forecasting system and methodology was described in a once-off document called METAMP study (Methodological Assessment of MARS Predictions available in:

<ftp://mars.jrc.it/Public/CGMS/METAMP/>

Besides, MARS-STAT is committed to exploring alternative more efficient approaches than the ones officially adopted for area estimates. In that direction the ICARE (Integrated Crop Area Estimate Project) study was achieved in 2002. The study aimed at the integration of LUCAS (Land Use – land Cover Area frame Survey) data with Administrative data, CORINE Land Cover and Medium resolution satellite data (MODIS) to improve area estimates as derived from LUCAS. The results were promising and further research will be made on the exploitation of MERIS and MODIS platforms for crop area estimates.

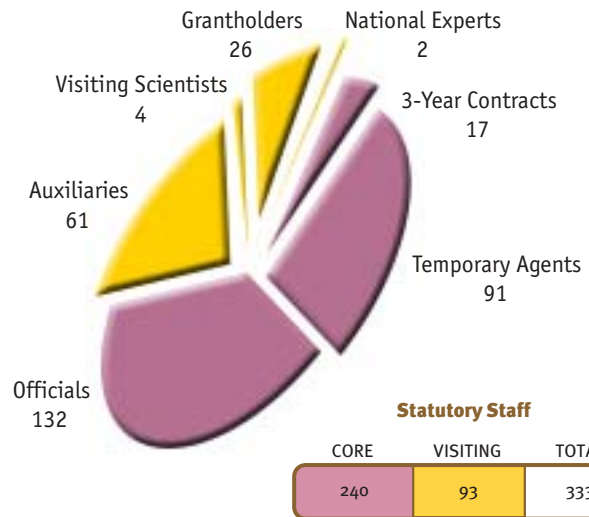
IPSC IN FIGURES

BUDGET



- Institutional Activities**
- Staff
 - Specific Credits
 - Means
 - Competitive Activities

RESOURCES FOR 2003



TQM, PERFORMANCE INDICATORS AND BENCHMARKING

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In line with the corporate initiative aimed at the establishment of a JRC-wide Total Quality Management (TQM) culture, IPSC is committed to a process of continuous improvement in order to achieve and/or maintain excellence in delivering products and services that consistently meet or even exceed needs and expectations of its customers and stakeholders at large.

Within this context, IPSC is engaged in aligning its management system with the provisions of relevant quality standards and guidelines. Some of the main elements currently supporting the development of a culture of continuous improvement are self-assessment and monitoring the opinion of the staff.



Following the initial exercise conducted in the year 2000, IPSC has conducted a new self-assessment exercise in the year 2002 using a pro-forma, perception-based approach based on the European Foundation for Quality Management (EFQM) excellence model properly supplemented by related JRC corporate guidelines. The 2002 self-assessment results have evidenced that assessment and review of its main processes and key performance results is an area where improvement would be desirable.

IPSC staff opinion survey was monitored at the corporate level through the e-administration of a dedicated questionnaire. The IPSC response rate of 79% was rather remarkable indicating a strong commitment of the staff to the organisation and a willingness to contribute to its improvement. The IPSC overall satisfaction rate has been estimated at 73%, slightly above the overall JRC satisfaction rate of 71%.

IPSC attaches great importance in setting scientific and administrative objectives at both the Institute and Units levels. Referring to the Institute objectives, 70% of the targets were met whereas 30% were partially met. Within the overall TQM initiative, IPSC encourages gender equality in science and pursues the development of a fair and effective equal opportunities working environment.

In order to share best practices with similar research organisations, IPSC is engaged in an on-going benchmarking exercise both at the JRC corporate level and bilaterally with the other JRC institutes and external organisations.

European Commission

EUR Report 20750 EN – Institute for the Protection and Security of the Citizen (IPSC) – Activity Report 2002

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The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Community. Close to the policy-making process, it serves the common interest of the Member States, while being independent of commercial or national interests.

