



Secured integrated processes in nanotechnology

Nanosafety hub meeting
23rd of march 2007

CILAS

5 facilities in France



Mont Audouze
Optronic Test Centre
(110 000 m²)



Orléans
Headquarters (30 000 m²)



Bordeaux LMJ Amplifiers
To be opened in 2007 - 8 000 m²



Limoges
Transparent
ceramics
development



Marseille
Optical Thin Films (4 000 m²)

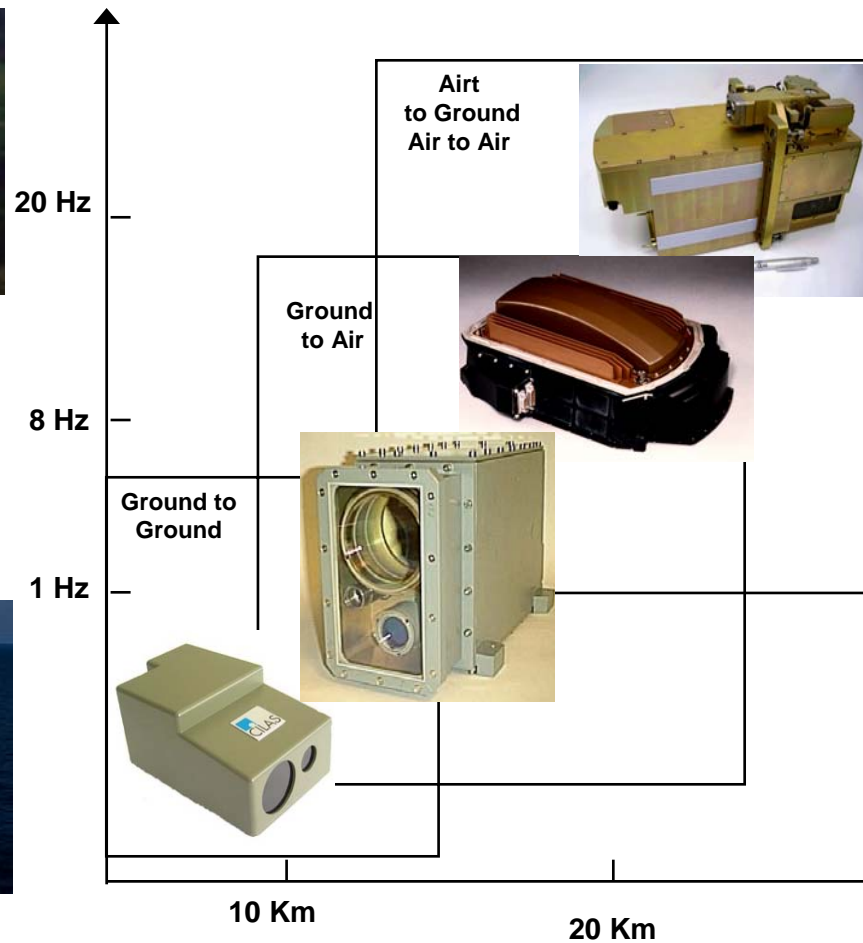
Range Finding & Designation



POD DAMOCLES



VIGY 105 - NAJIR 2000



STRIX / OSIRIS - TIGER



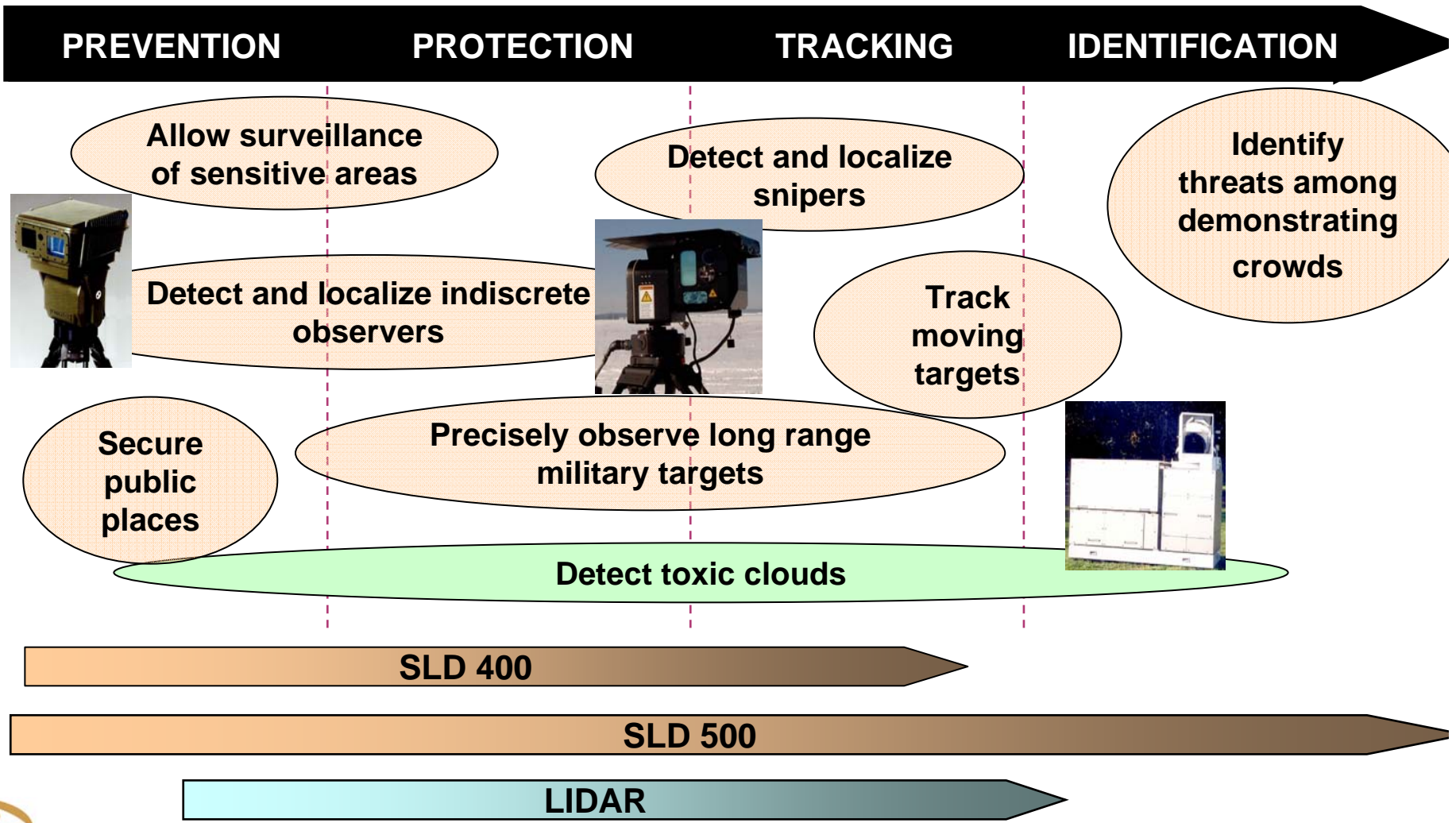
CV 90

Active Imaging

Active Imaging principle consists in lighting a scene with an invisible laser beam. The lighted scene is observed with a camera sensitive to the specific laser wavelength used.



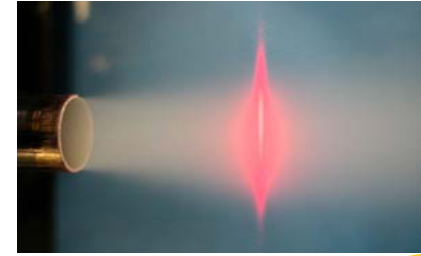
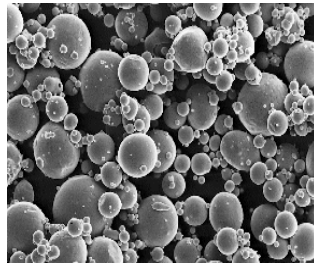
Active Imaging



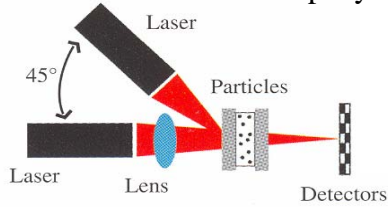


1992: under see application for Ifremer company

2000: Development of integrated shape analysis



2004: Development of « DJD » technology for application in dry area



1990: Invention of **Multi-lasers solution** for small particles



1969: CILAS is inventor of particle size analyzer



1969

1990

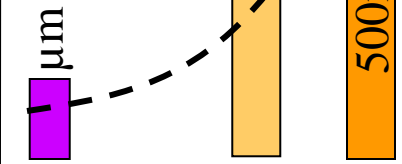
1992

2000

2007



Dynamic of measure



1969

2007

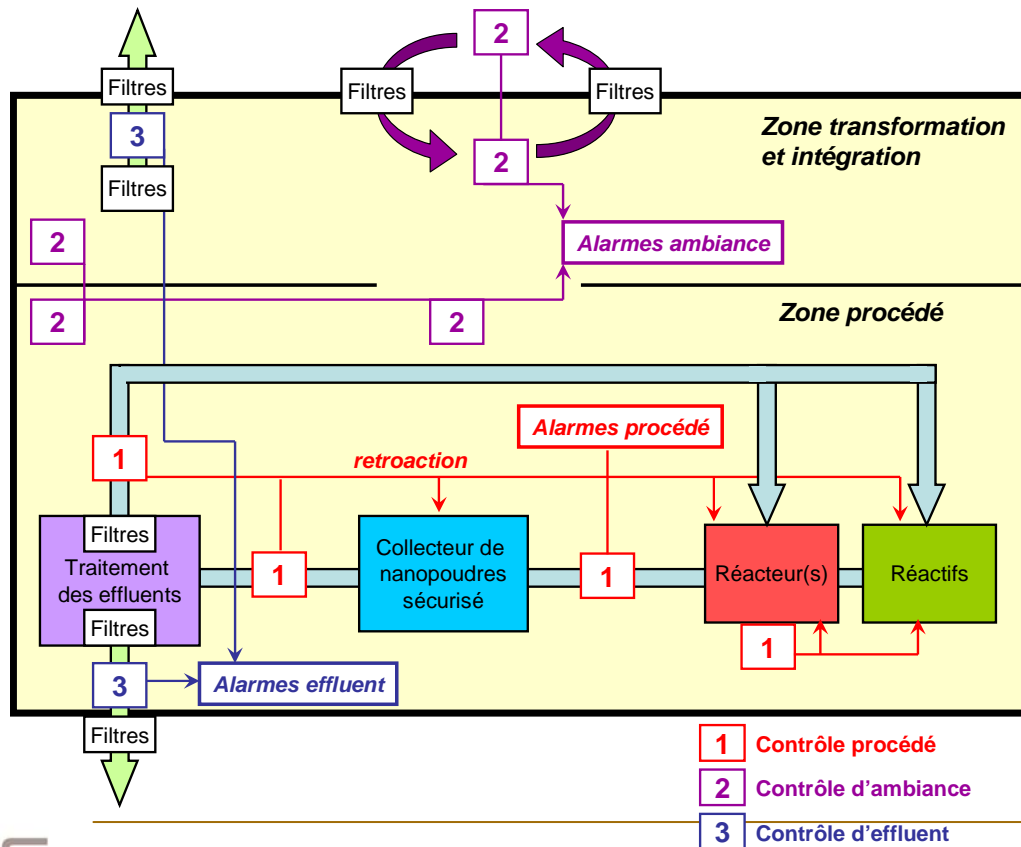
500nm to 2µm

Secured integrated processes : current situation

- huge development of application
- Nanoparticles production quantity increases (world wide market: 700-1000 billion Euros)
- toxicity aspects are still unknown
- Work on standards to be done (classification, terminology, instrumentation, metrology, simulation...)

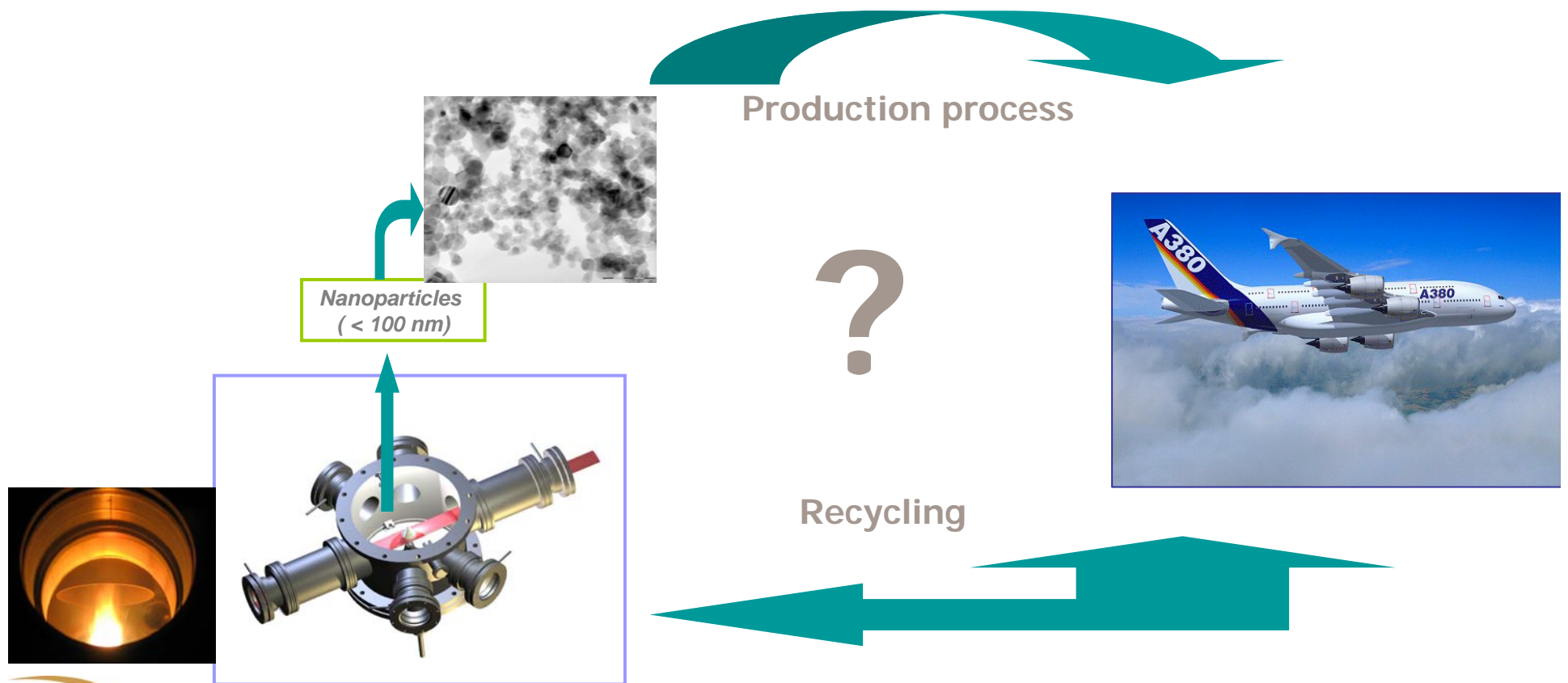
Secured integrated processes : needs

Imagine and build the plant of the future which allows to produce nanoparticles in safe ways



Secured integrated processes : needs

Develop new equipments which give guaranty regarding security all along the process from the raw material production until the final application



Secured integrated processes : the gap

Between the raw material and the final application:
Avoid any contact between operators and material

Solution: fully automated tools which allow to
confine the production line:

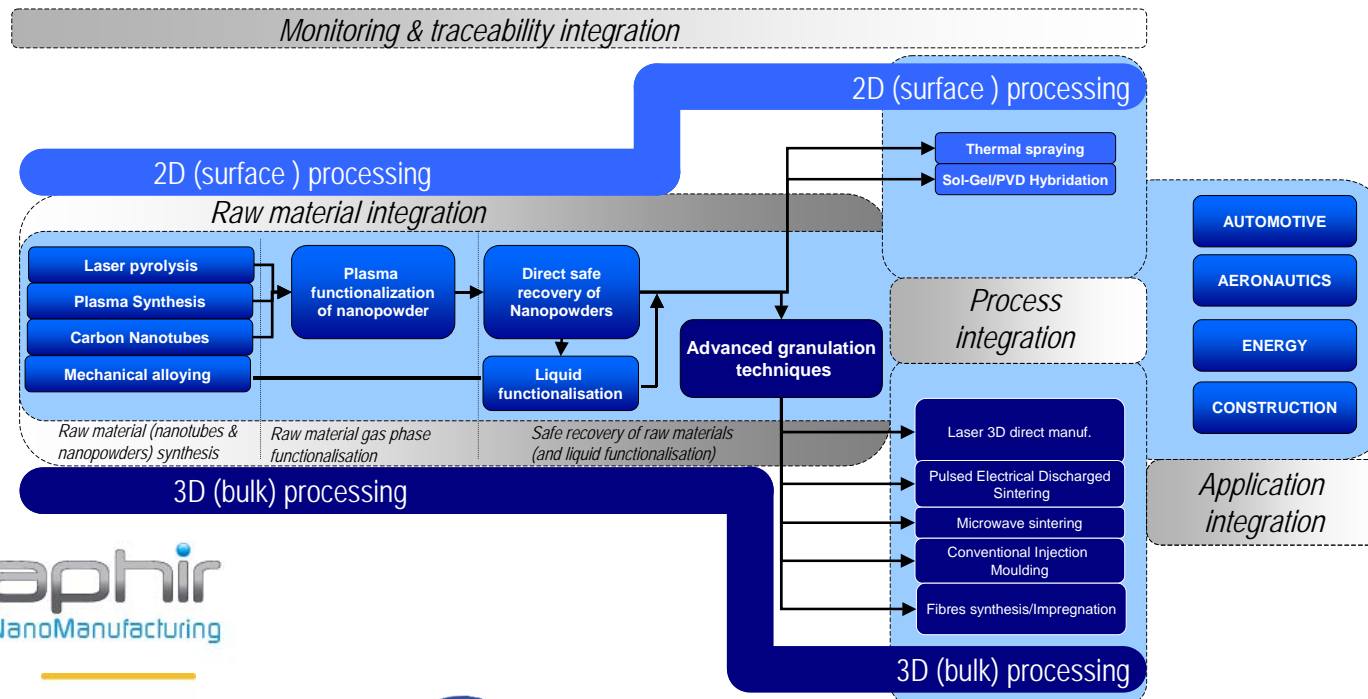
- Raw material synthesis
- functionalisation
- Dry or wet recovery
- Granulation, consolidation
- Processing (surface or bulk)

Secured integrated processes :

SAfe, integrated & controlled **P**roduction of **H**igh-tech multifunctional materials and their **R**ecycling

SAPHIR is a 4 year research project partially funded by the European Commission in the Sixth Framework Programme for Research and Technological Development, within the Third Thematic Priority (NMP: Nanotechnology and nanosciences, knowledge-based multifunctional materials and new production processes and devices).

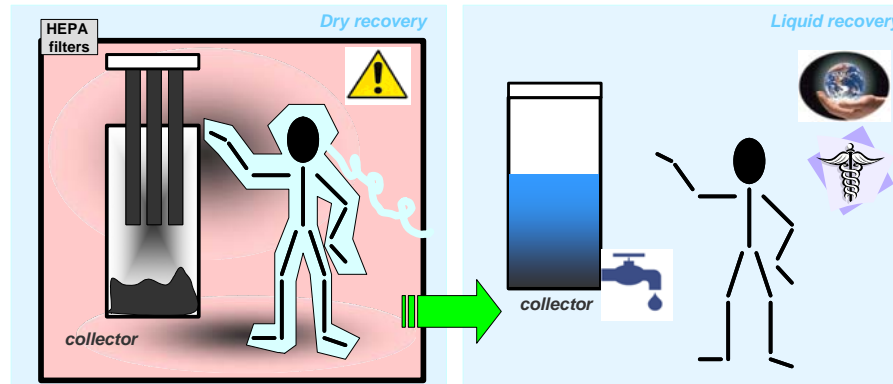
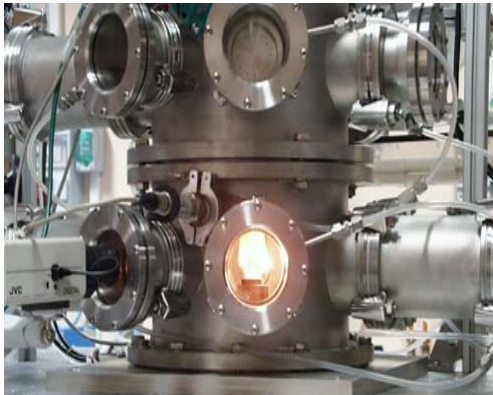
The consortium of SAPHIR is composed of 22 partners from Industry, SMEs, Universities and other Research Institutions, coming from 11 different European countries as well as Canada.



Secured integrated processes : process tools



In line, automatic, non invasive
Rapid measurement and
characterization are not available
at nanoscale



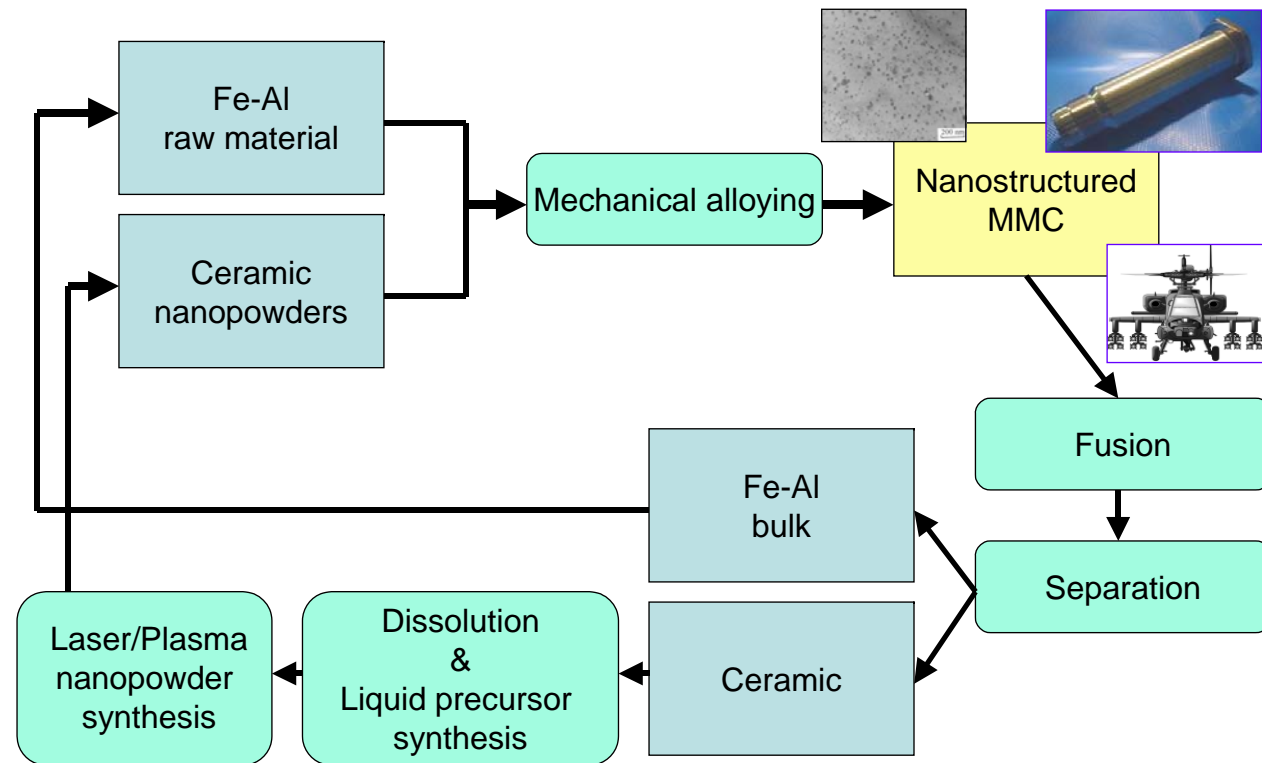
Safe recovery system to prevent from dispersion



Software to control the production and to avoid any interaction with the operator

Secured integrated processes : Recycling

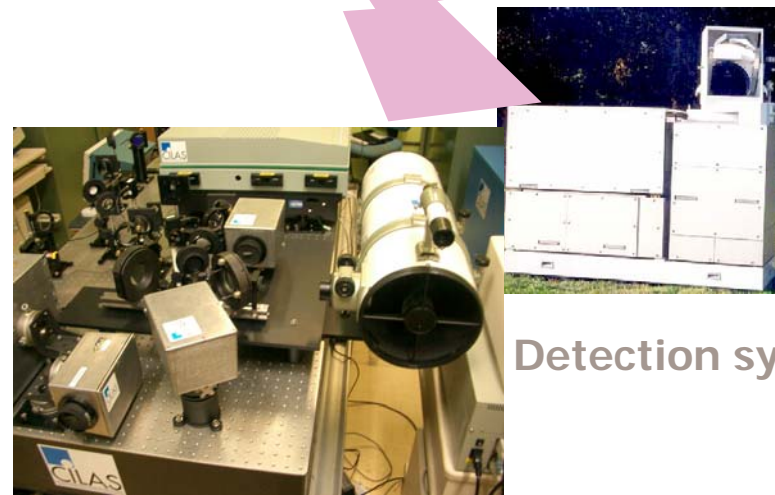
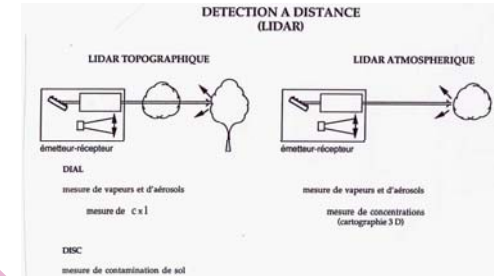
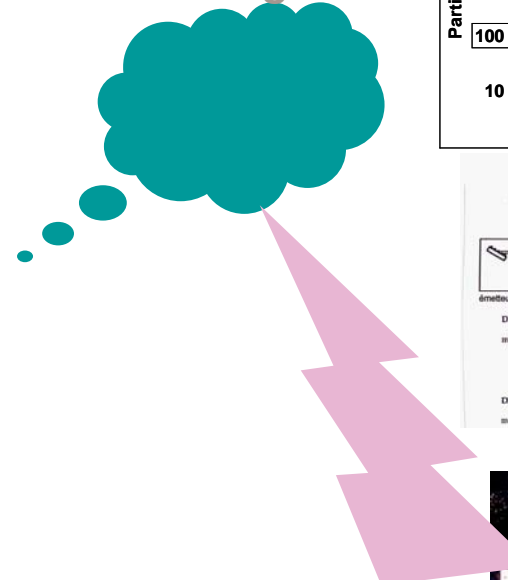
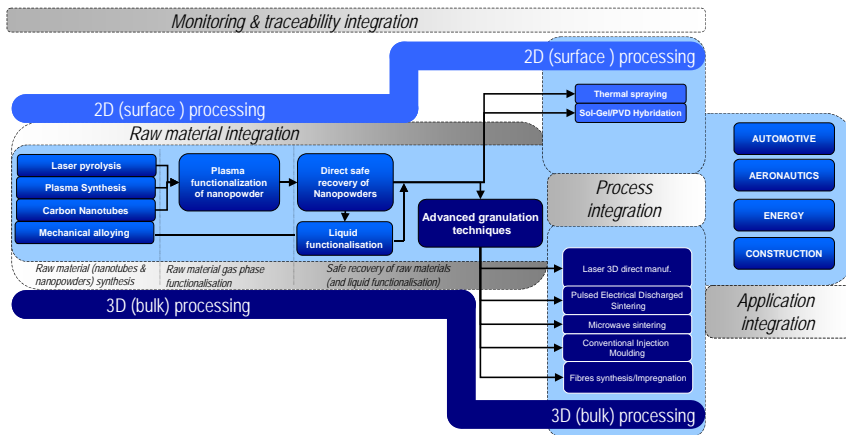
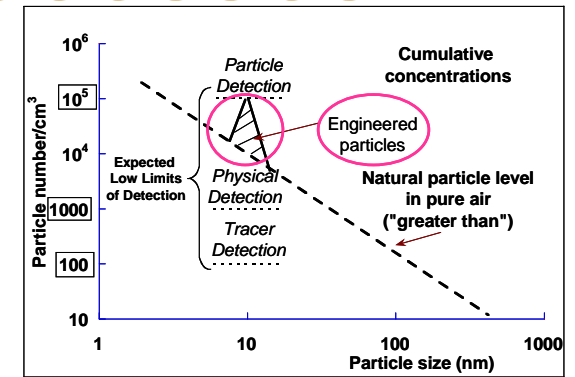
As an example, in the case of FeAl based MMC, a quite simple procedure can be imagined to recycle parts arrived at the end of their life, as depicted in the sketch below. On the other hand, working practices will be issued from the building industry to orientate the recycling issue towards eco-conception.



Secured integrated processes: detection

Nanoparticles leakages

Production plant



Detection systems

summary

- In France and in Europe the development of nanotechnologies is conditioned by the installation of safe production plant
 - Tools for automated processes
 - Tools for detection
 - Tools for exposure (badges...)
- The E.C. funds already projects in FP6:
 - NANOSAFE 2 (develop risk assessment and management for secure industrial production of nanoparticles)
 - SAPHIR
 - And efforts will be intensified in the frame of FP7: GENEPI