

Higher education and training of  
European explosive specialists, some  
suggestions for European co-operation  
founded on the Bologna process

by

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Sweden

*A decreasing  
but very important  
Swedish and European industrial sector  
needs a new system to  
university education*

*A system based on the Bologna process?*

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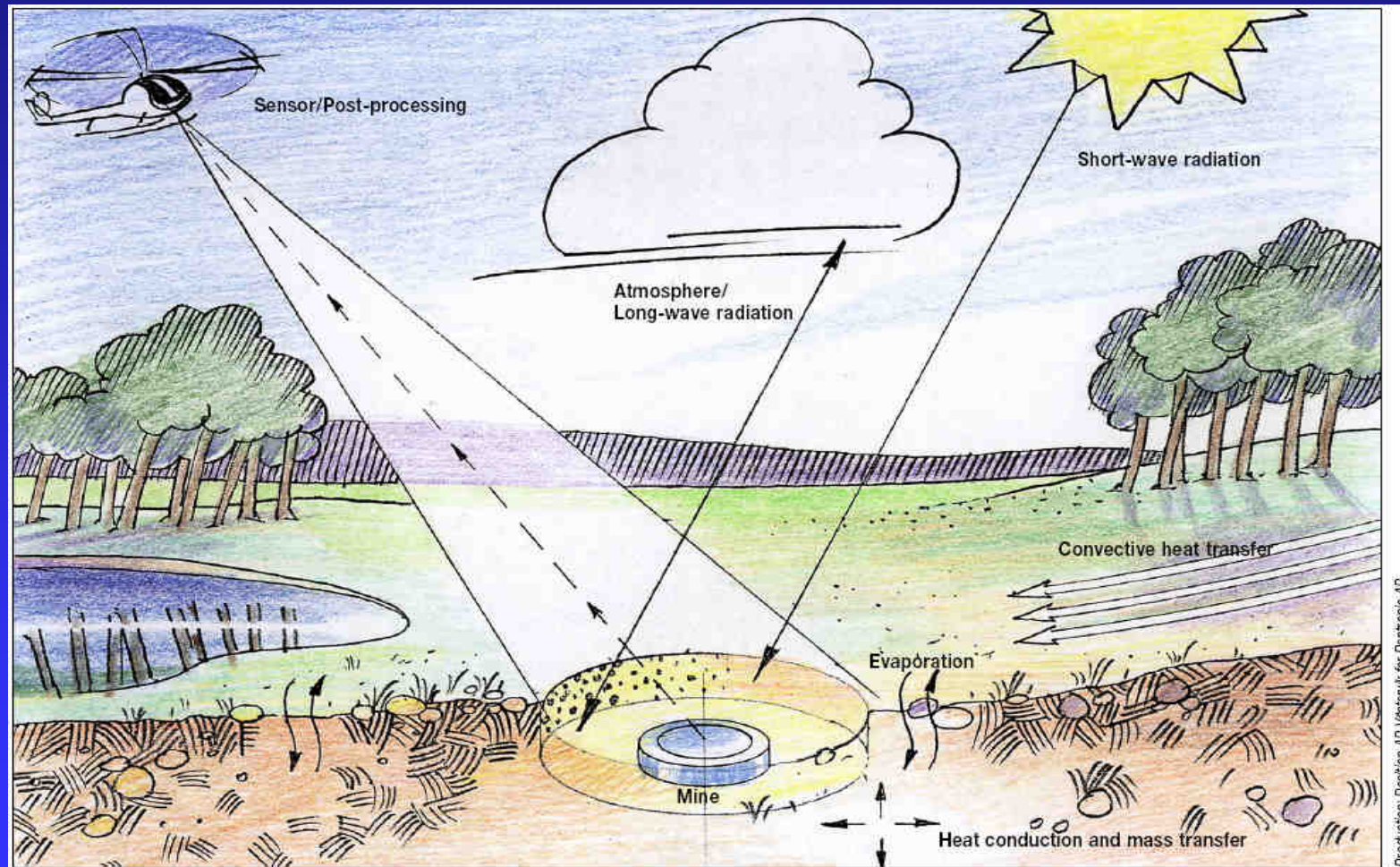
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# Detection and disposal of explosives is an important interest for the authors



# Contents of the presentation

- Introduction and the problem
- The education system at Swedish universities today and in the future
- The Swedish explosives industry
- Are there any Swedish alternatives to the Bologna process?
- A possible future system for university education in Sweden
- Summary

# Introduction and the problem



# Life-long maintaining and development of competence is necessary depending on

- The ongoing fast development of the engineering science
- The increasing competence demand from the companies and the society
- Facilitate for the expert to work in other working areas
- Increase the self-confidence of the expert

# Some activities relevant for explosive specialists in Sweden (and in Europe)

- Research in order to study and develop new explosives and to improve existing explosives
- Production of new and existing explosives
- Recycling and reuse of explosives
- Disposal or neutralisation of explosives
- Research and development of sensors for detection of different types of explosives
- Detection of explosives in Sweden and abroad

Life-long maintaining and development  
of competence is necessary in all  
industrial sectors and especially in the  
explosives sector

A new education system  
is needed!

# The education system at Swedish universities today and in the future

# Higher engineering education at universities and university colleges in Sweden - today

- Engineering education, 3 years; bachelor level ("högskoleingenjör")
- Engineering education, 5 years, earlier 4.5 years; master level ("civilingenjör")
- PhD in engineering, 4 years ("teknologie doktor")

# Higher engineering education at universities and university colleges in Sweden – 2007 and ahead

- The European Bologna process is introduced
- Engineering education - bachelor level; 3 years
- Engineering education - master level; 2 years (i.e.  $3 + 2 = 5$  years education)
- Engineering education - master level; 5 years ("civilingenjör"). Remains
- PhD in engineering, 4 years. Remains

Can the higher education of  
explosive specialists be included  
in the Bologna system?

Are there any alternatives?

# The Swedish explosives industry today and 20 years ago



# The situation in the Swedish explosives industry

1987

2007

- Two very large Swedish actors, Bofors and FFV, with a broad competence
- Both actors had large departments for training and education
- A number of small actors
- Only a few actors have more than 100 employees
- No (?) departments for training and education exist any longer

# The number of employees in the explosives industry

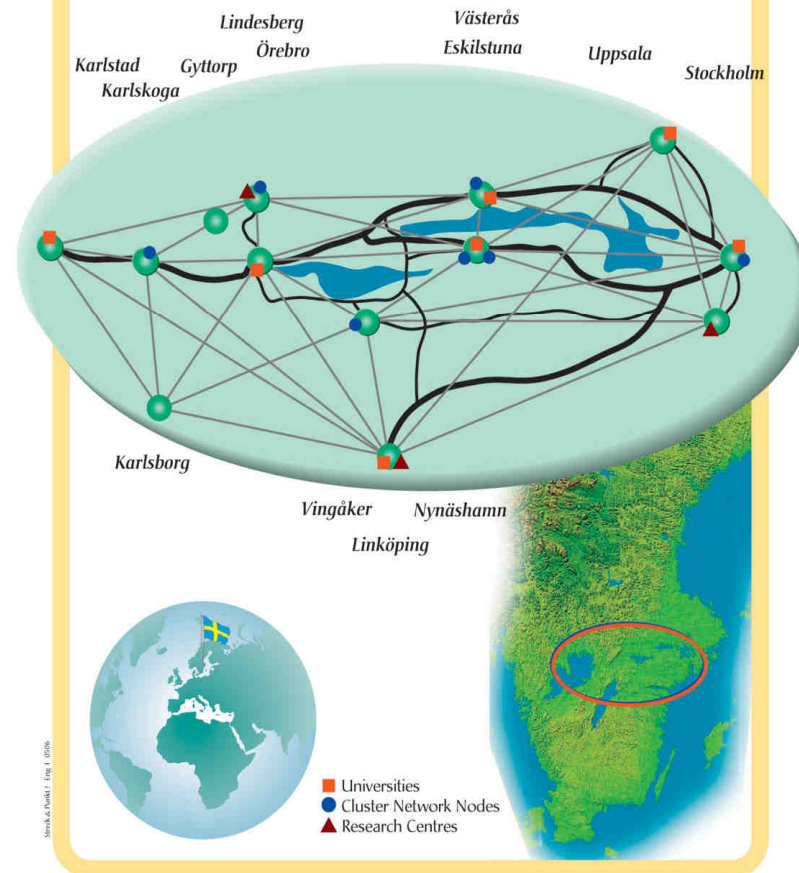
1987

2007

- Bofors and FFV: 5500 of 20 000 worked in the explosives sector
- Other actors: 2000 in the explosives sector
- Totally: almost 8000 worked in the explosives sector
- Totally: 2500 including administration, service, transportation etc
- About 500 of 2500 work at a number of small actors
- Some actors are very small

The main part of the explosives network in Sweden 2007 is situated in southern Sweden

The Alfred Nobel explosive Industrial emporium was originally founded around the Lake Mälaren. Today a Cluster and a Network for explosive co operation are growing.



# Can external engineering courses in Sweden form an alternative education system for the explosives industry?

Is it possible to use the existing type of external engineering courses for university education of experts in the explosives industry?

**Yes and No!**

# Four examples of courses for engineers and relevant for engineers in the explosives sector

- Security at transports (organizer: KCEM)
- Risk analysis of explosive storage (KCEM)
- Heat transfer – theory and industrial applications (organizer: The Swedish education company, STF)
- Industrial temperature measurements (STF)

# Characteristics of an external course for engineers in the Swedish industry

- The subject of the course is often fairly general
- The course participants come as a rule from different industries and from different sectors
- The lecturers are generally specialists coming from industries and the university world
- It is often a three day course placed in e.g. a conference hotel

# Some very appreciated parts of a traditional external course

- The possibility to meet and discuss with other specialists who have similar technical problems
- The overview presentations given by specialists from industry and university
- Demonstrations of phenomena and industrial equipments
- The possibility to learn the subject by way of different team-work projects



Is it realistic to produce the necessary number of new external courses for the Swedish explosives sector in the traditional way?

With very few exceptions

**No!**

because of ....

## ... the economic boundary conditions existing in the explosives industry

- A traditional course is often too expensive to accomplish for the organizer – too few possible participants in the Swedish explosives industry
- A traditional course can be too expensive to develop as it can not be repeated every year or at least every second year – too few participants
- The education cost is often too high for the actors

# A very important exception!

Education which is necessary from a security point of view or claimed by the public authority

# A possible future system for university education in Sweden

# A new system solution university education in the explosives sector

A combination of  
university courses within the Bologna system  
and  
external courses for explosives specialists

# A new type of university education on master level for specialists in the explosives sector

- Use one year of a relevant engineering education on the master level in the Bologna system as a base (1 year)
- Half a year is used for external and university courses in the explosives sector in Sweden and abroad (0.5 year)
- The diploma work is connected to an industry in the explosives sector in Sweden or abroad (0.5 year)
- European transnational co-operation is necessary
- The 2 years education gives academic points and the cost for the student, the university and the industry is limited

# Five partners are involved in the process

- The student
- The university
- The industry
- The research agencies
- The society

# Some essential requirements for a first-rate external course

- A well-adapted pedagogy
- Competent lecturers interested in education
- The course must reflect state of the art
- Good course documentation
- A discussion forum
- Demonstration of phenomenas
- Demonstration and use of industrial equipments
- Group projects
- **Academic points**



# Who can organize the external courses for the explosives sector?

- A defence company?
- The Swedish defence research agency, FOI?
- A new course organizer controlled by the defence industry and the defence research agencies?
- A university or university college in collaboration with KCEM?!
- An international course organizer?
- Someone else?

# Summary

A new system solution for higher  
education and further education

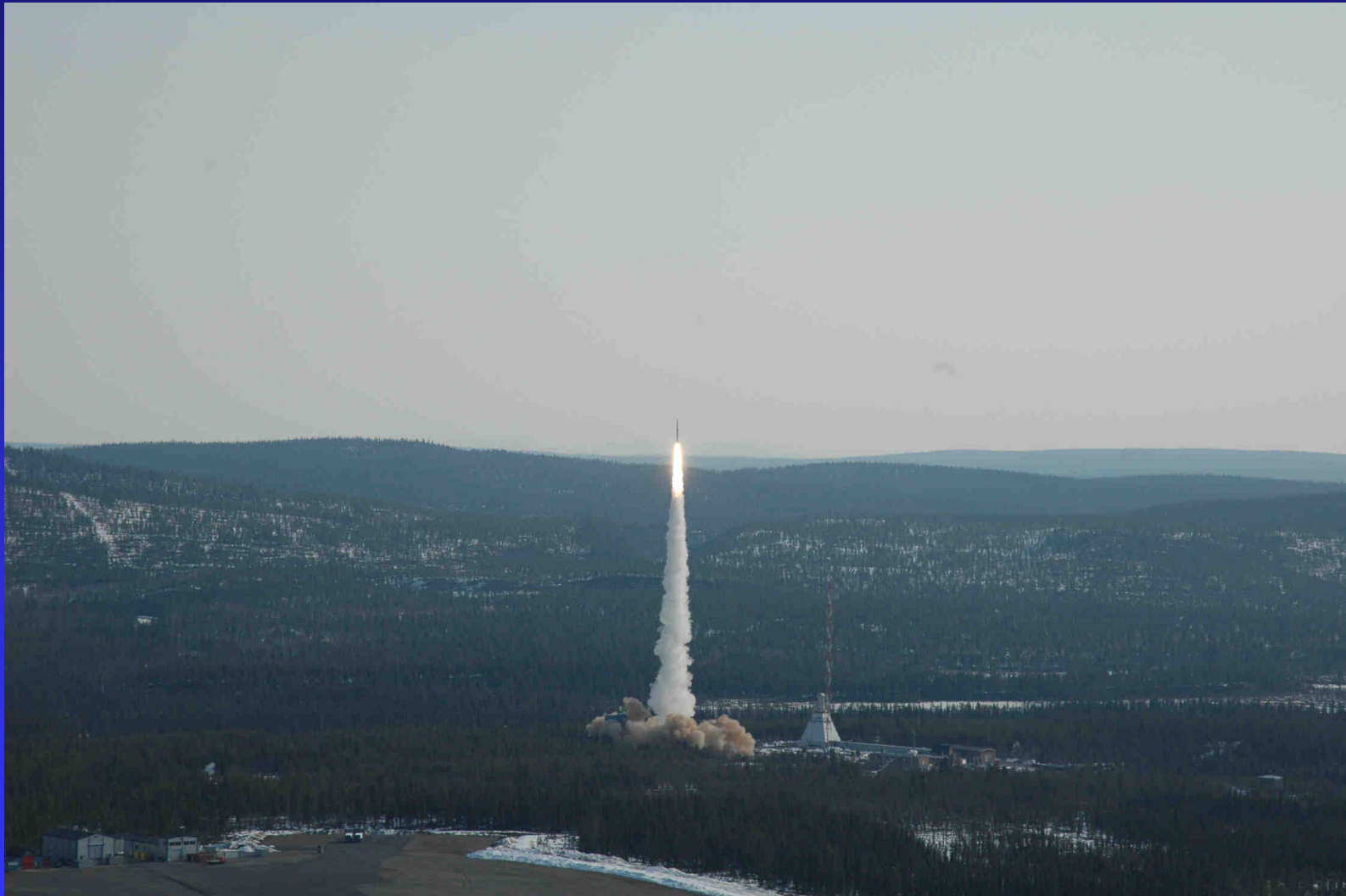
A combination of  
university courses within the Bologna system  
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*A system solution based on  
European Qualifications Framework, EQF*

## Some very essential questions ...

- Is the Swedish explosives sector including defence industry, research agencies, public authorities and other interest groups a too small market for a specialized university education?
- Have the Swedish explosives sector and the Swedish universities the required competence for all necessary courses?
- Can an international co-operation be a way to solve a part of the education problem?

# Comments Questions ?



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If you have questions and  
comments after the conference –  
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# Detection of IED is now a Swedish problem – is our education relevant?





# Detection of IED is now a Swedish problem – is our education relevant?



Photo: Jehan Solberg ICPC

