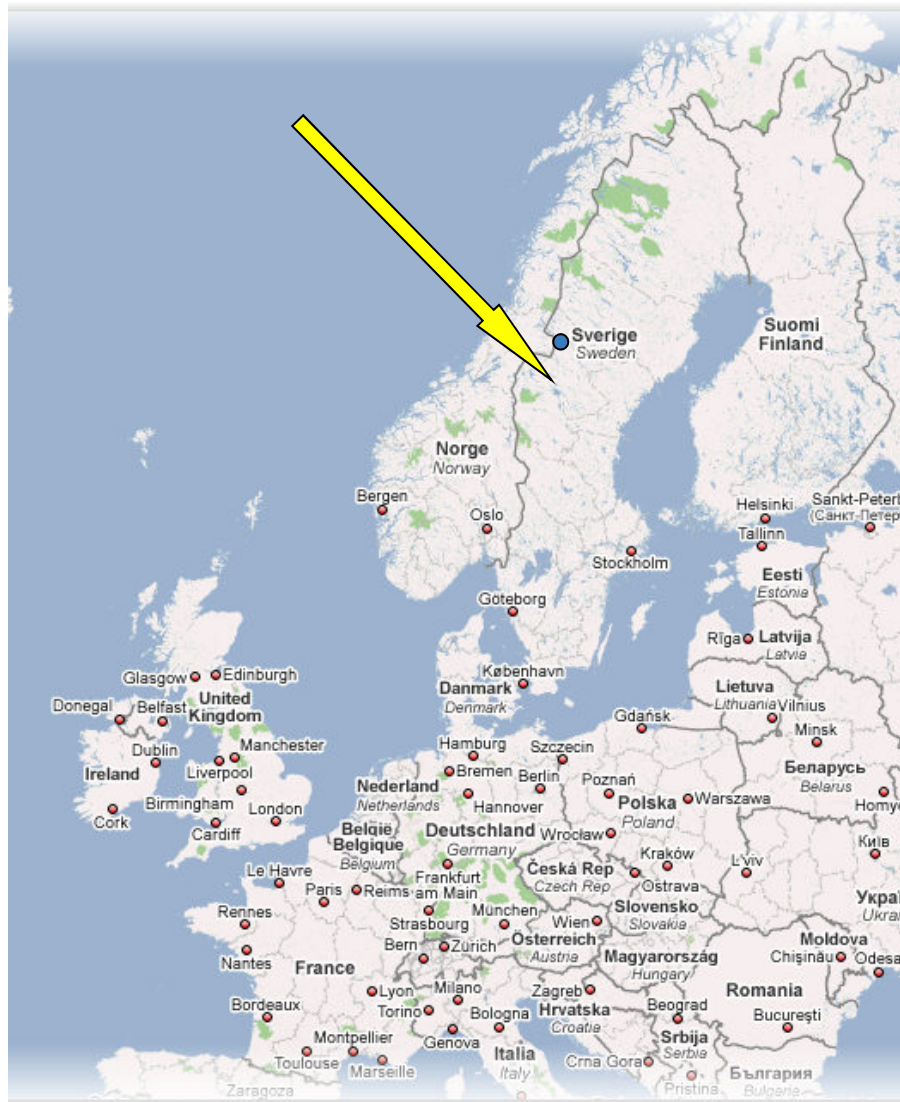


LOWER LEG PROSTHESIS FOR NORDIC SKIING SKATE TECHNIQUE –FROM PROTOTYPE TO PRODUCTION

Tommy Mellberg¹, Per Skoglund¹, Robert Isaksson¹, Bengt-Åke
Fastesson², Jonas Danvind^{1, 3}

- 1. Mid Sweden University, Östersund, Sweden**
- 2. MA Nordic, Östersund, Sweden**
- 3. The Swedish Sports Organization for the Disabled and The Swedish Paralympic Committee**



.SE
LIGHETER



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OBJECTIVE

- Develop a lower leg Nordic skiing prosthesis for skate technique.

THE "NUCM VINTERIDROTT" PROJECT

"National Development Centre Mid Sweden –Winter sports for people with a disability"

- Availability and Facilities
- Education and Knowledge
- Equipment



Future: Sweden4all

OLD PROSTHESIS

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Design Criteria

Brain-storming

Design data

Concepts

Sketches

FEM

Prototype

Field test

DESIGN CRITERIA

- 1) adjustable **inversion-eversion** angle of the ankle
- 2) restricted **flexion-extension** angle of the ankle
- 3) adjustable attachment of lower part
- 4) ordinary binding system (first Rottefella NNN, then Salomon SNS)
- 5) adjustable rotation angle

Design Criteria

Brain-storming

Design data

Concepts

Sketches

FEM

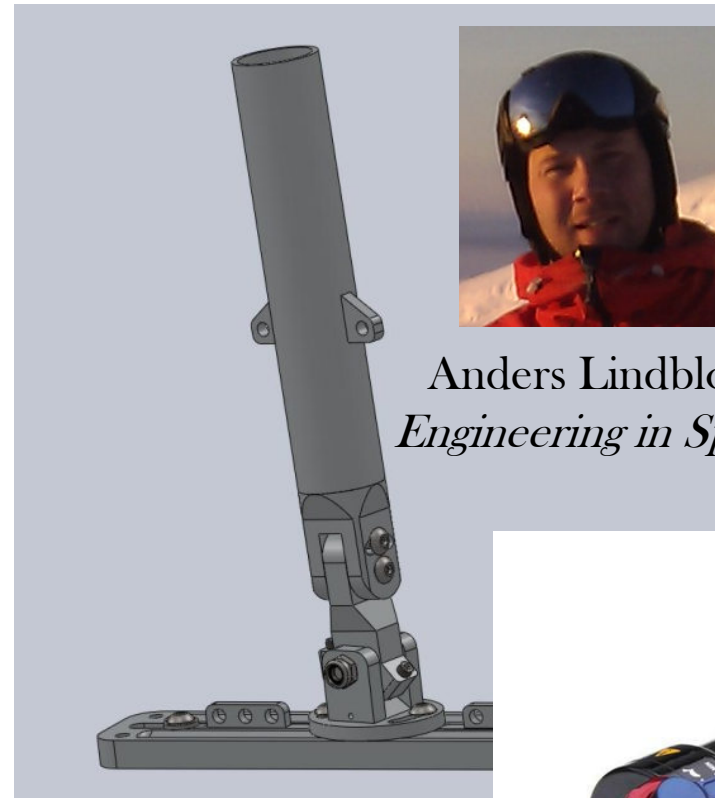
Prototype

Field test

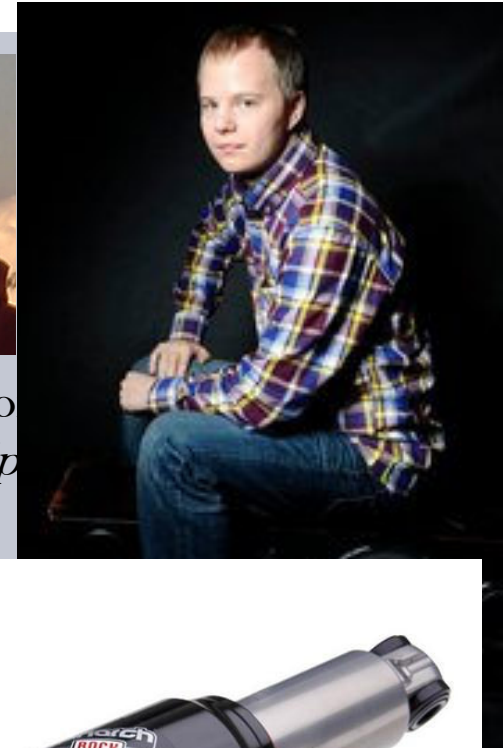
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BRAIN-STORMING

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Anders Lindblom
Engineering in Sports



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Design Criteria

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Field test

Design Criteria

Brain-storming

Design data

Concepts

Sketches

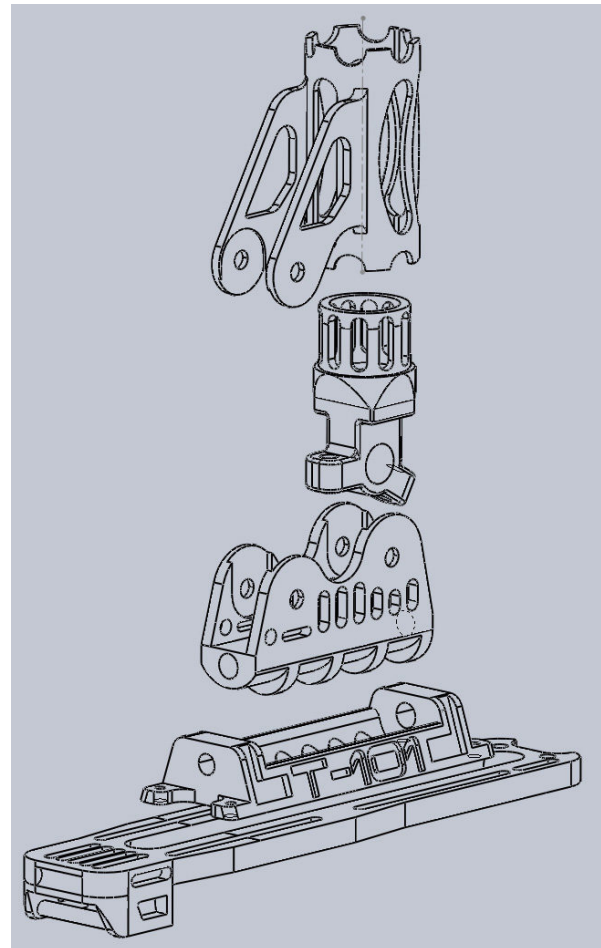
FEM

Prototype

Field test

CONCEPTS

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Software:
SolidWorks

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Design Criteria

Brain-storming

Design data

Concepts

Sketches

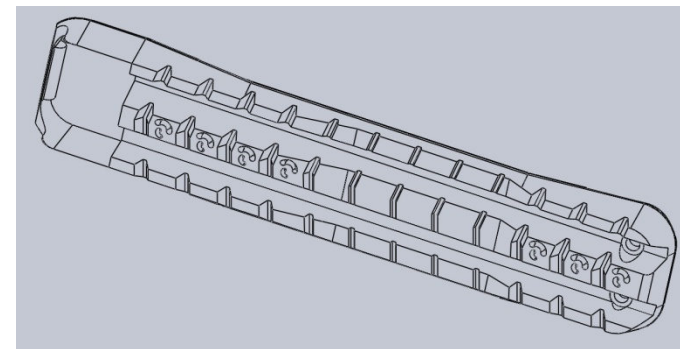
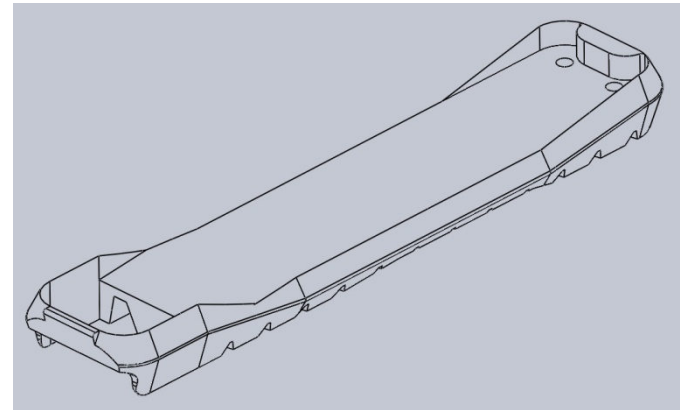
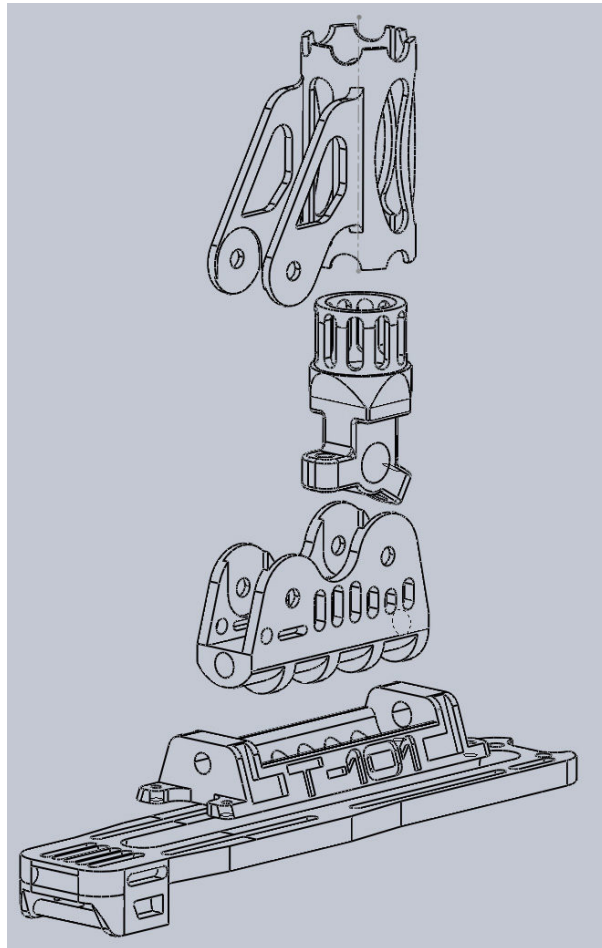
FEM

Prototype

Field test

SKETCHES

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Design Criteria

Brain-storming

Design data

Concepts

Sketches

FEM

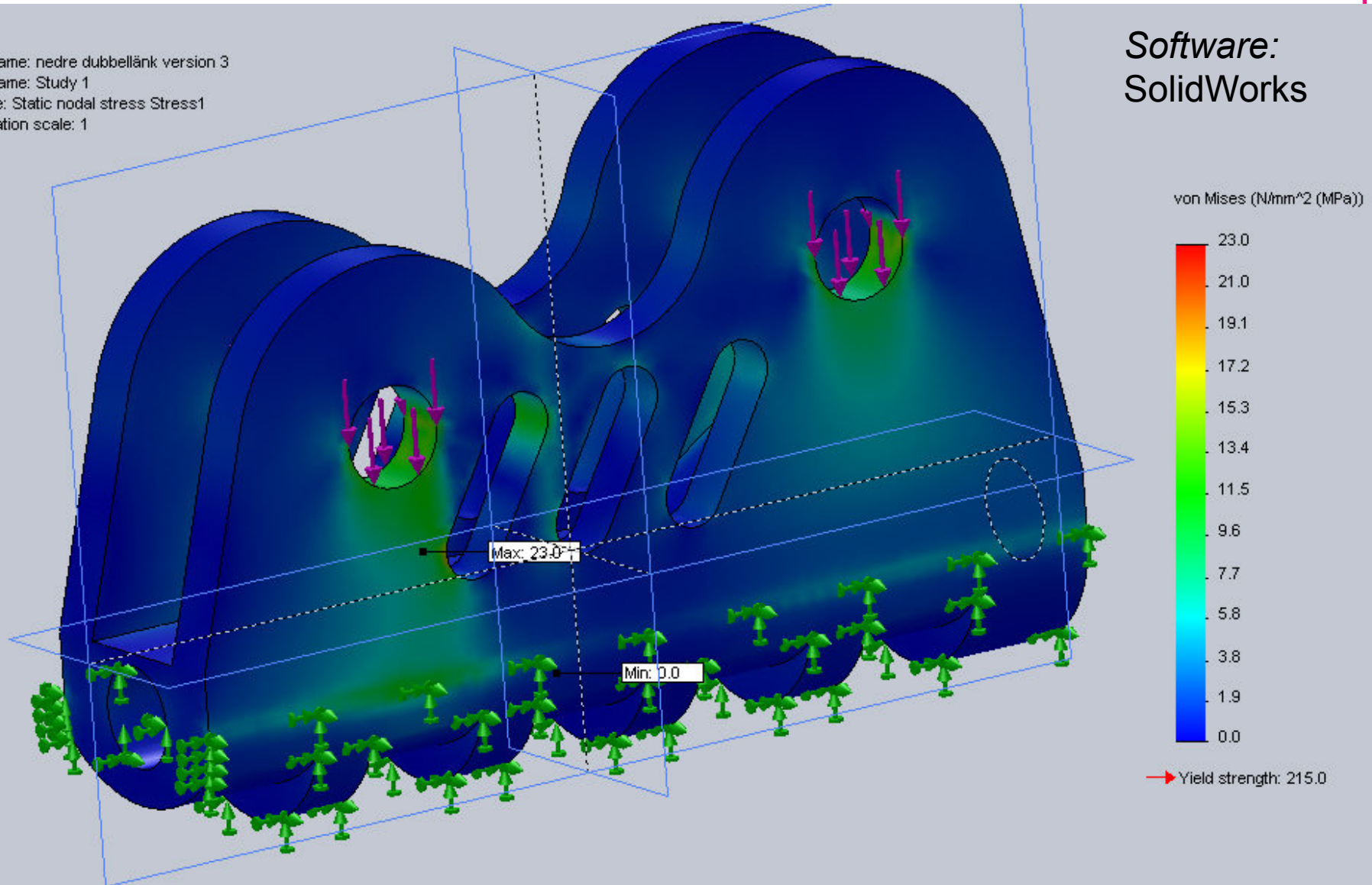
Prototype

Field test

FEM CALCULATIONS

Model name: nedre dubbellänk version 3
Study name: Study 1
Plot type: Static nodal stress Stress1
Deformation scale: 1

Software:
SolidWorks



Design Criteria

Brain-storming

Design data

Concepts

Sketches

FEM

Prototype

Field test

Objet Eden 260V

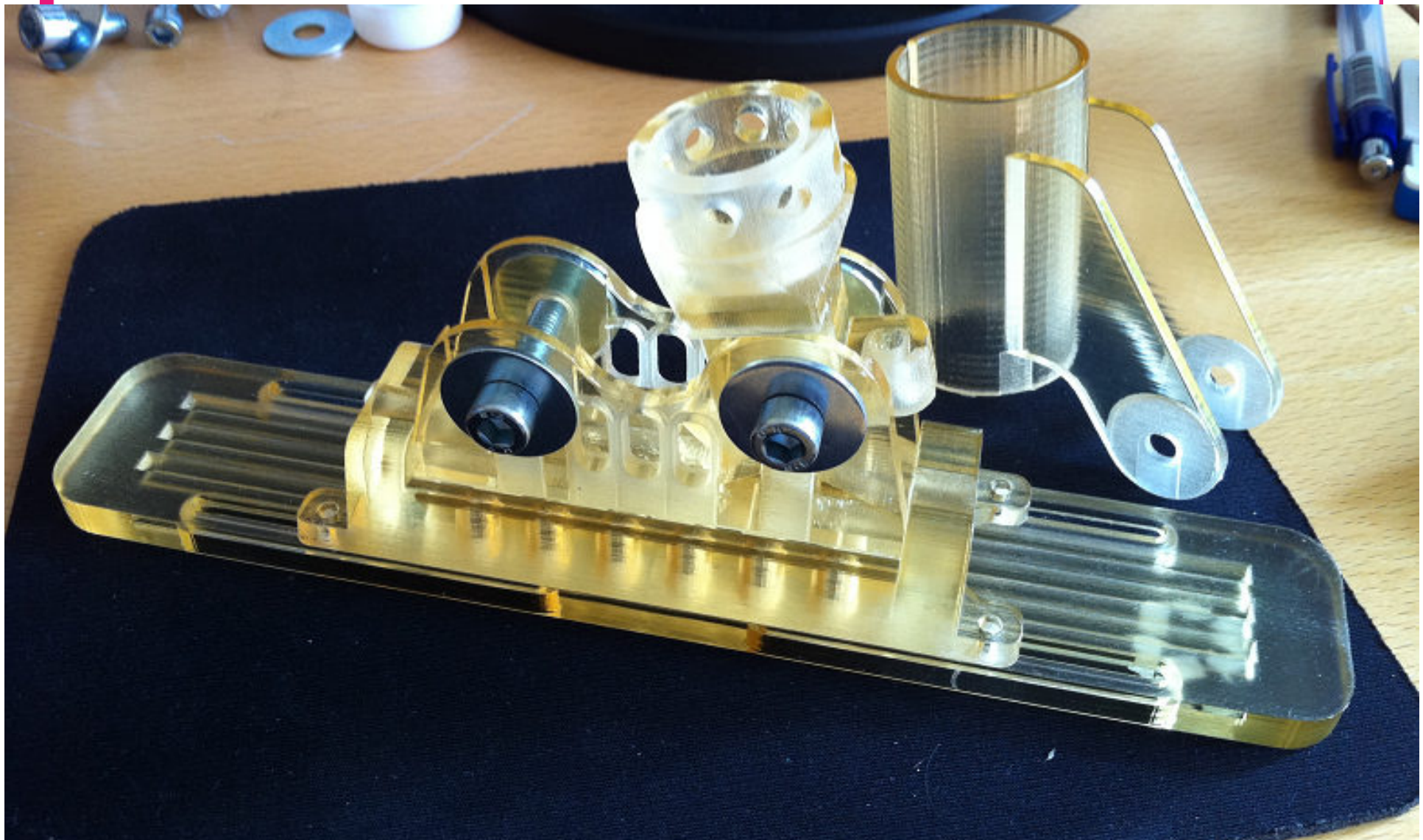


Arcam



PLASTIC PROTOTYPE

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TITANIUM PROTOTYPE

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Investing in your future



Design Criteria

Brain-storming

Design data

Concepts

Sketches

FEM

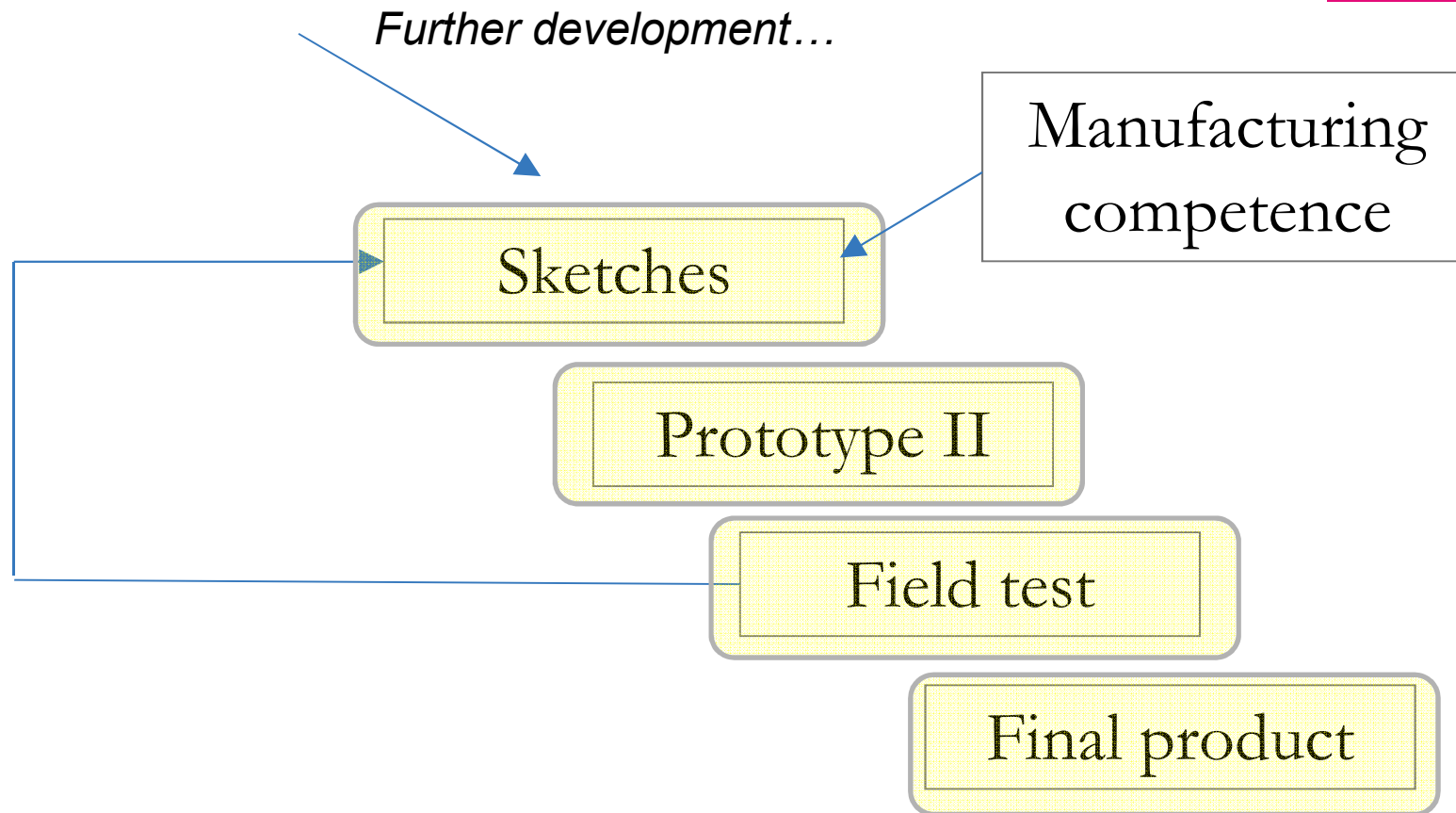
Prototype

Field test

DESIGN CRITERIA, TI PROTOTYPE

- +** 1) adjustable **inversion-eversion** angle of the ankle
- +** 2) restricted **flexion-extension** angle of the ankle
- +** 3) adjustable attachment of lower part
- +** 4) ordinary binding system (Rottefella NNN)
- +** 5) adjustable rotation angle
- -** 6) low cost
- ++** 7) rigid (athlete's perception)







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DESIGN CRITERIA , TI PROTOTYPE

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1) adjustable **inversion-eversion** angle of the ankle



2) restricted **flexion-extension** angle of the ankle



3) adjustable attachment of lower part



4) ordinary binding system (Rottefella NNN)



5) adjustable rotation angle

















6) low cost



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DESIGN CRITERIA, FINAL

-   1) adjustable **inversion-eversion** angle of the ankle
-   2) restricted **flexion-extension** angle of the ankle
-   3) adjustable attachment of lower part
-   4) ordinary binding system (**Salomon SNS**)
-   5) adjustable rotation angle
-   6) low cost
-   7) rigid (athlete's perception)



FUTURE DEVELOPMENT



Make the product available to the market

Continuous improvements (construction, weight, cost)

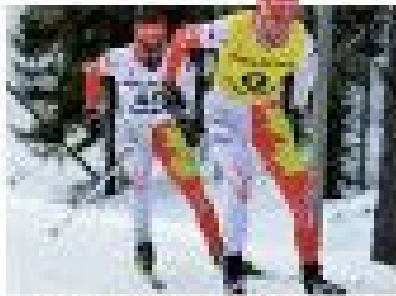
Development of prosthesis for classical skiing

Adopt to skates and in-lines

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IPC Nordic Skiing World Championships



Events ranged from sprint to 100 km, including biathlon, cross-country, and long-distance races.

Top medalists included Sweden's Helene Ripa, who won gold in the 10 km cross-country race.

Sweden's Helene Ripa won gold in the 10 km cross-country race.

Other medalists included Germany's Anja Richter and Norway's Helene Riiser-Larsen.

Germany's Anja Richter won silver in the 10 km cross-country race.

www.paralympic.org/paralympic/games/2011/nordic-skiing

Sweden's Helene Ripa won gold in the 10 km cross-country race.



Helene Ripa



Men's Biathlon (Mixed)		
Paralympic Athlete: Gunnar Moberg, Sweden (C1-3)		
Event	Medal	Age
15 km (100m visual, 50m auditory)	Gold	34
15 km (100m visual, 50m auditory)	Silver	34
15 km (100m visual, 50m auditory)	Bronze	34

IPC Nordic Skiing World Cup

The IPC Nordic Skiing World Cup is the highest level of international competition for Paralympic athletes.

WOMEN'S BIATHLON	
Medal	Age
Gold	34
Silver	34
Bronze	34
MEN'S BIATHLON	
Medal	Age
Gold	34
Silver	34
Bronze	34



NUCM
Vinteridrott