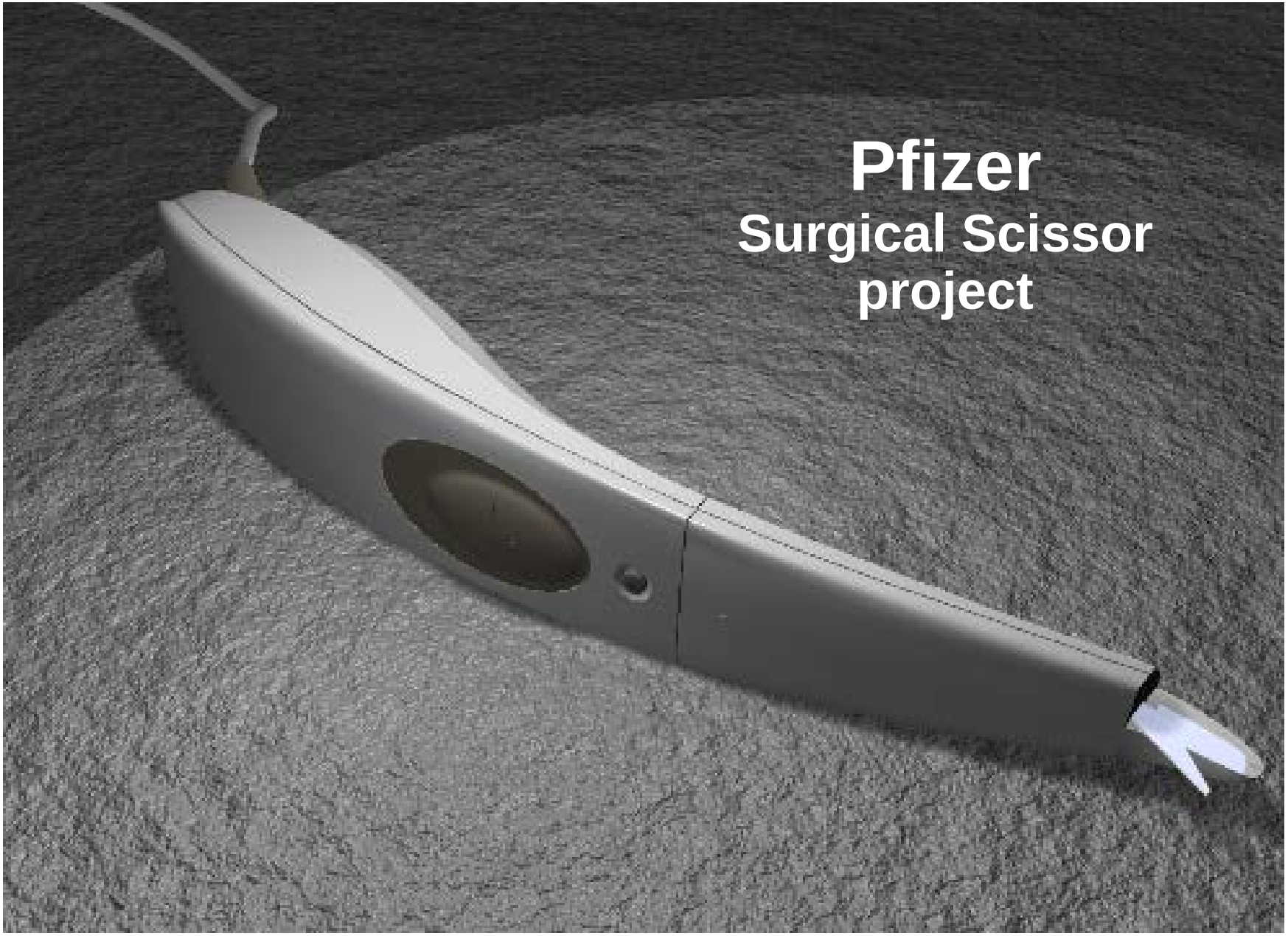
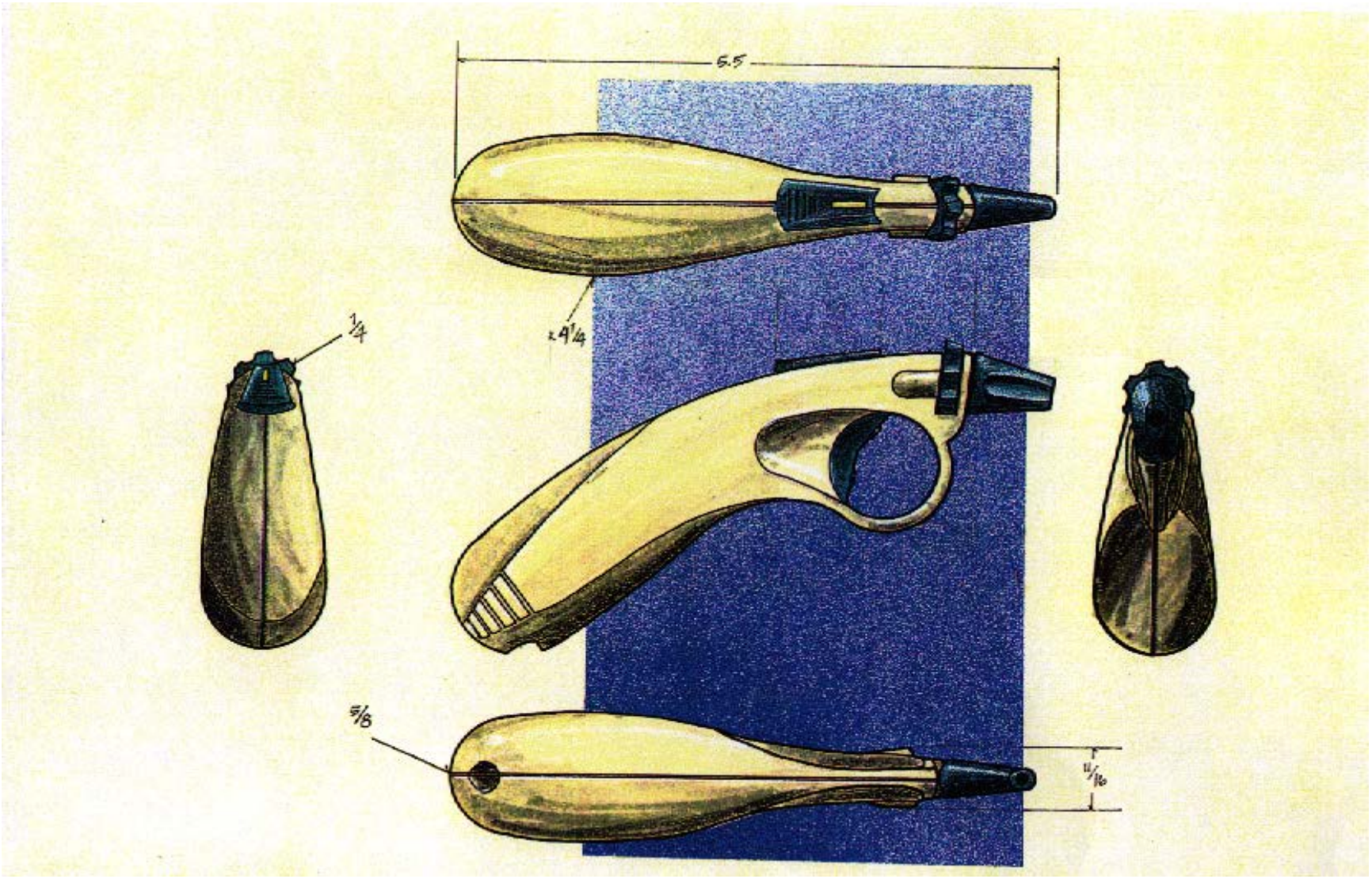

Pfizer
Surgical Scissor
project

Laparoscopic Scissor Design

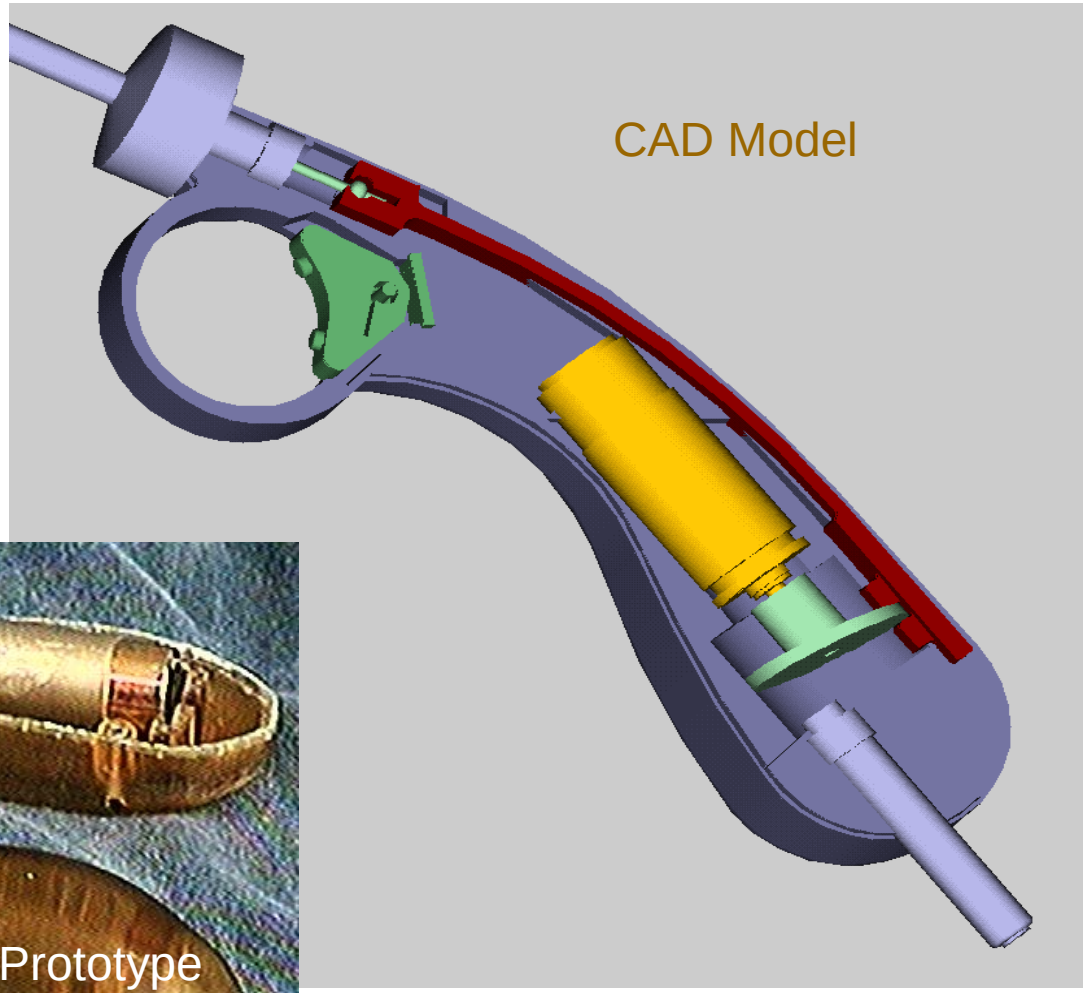


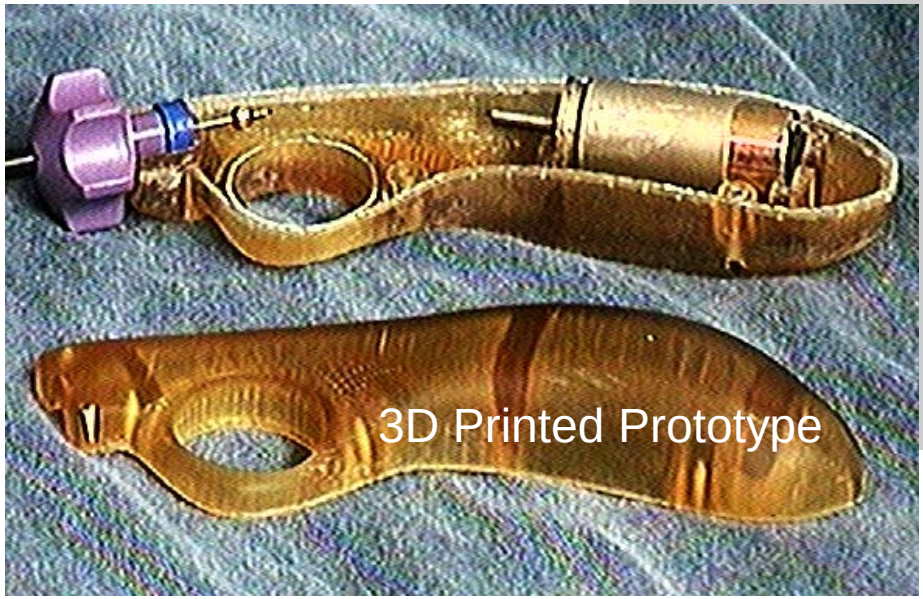
Developed scale, size, key features and get customer feedback with foam models and renderings

Primary Drivers of the Creative Process

Pfizer Laparoscopic Scissor project

- Materials
- Manufacturing Processes
- Manufacturing Cost





Innovation: Flexshaft

Pfizer Case Study

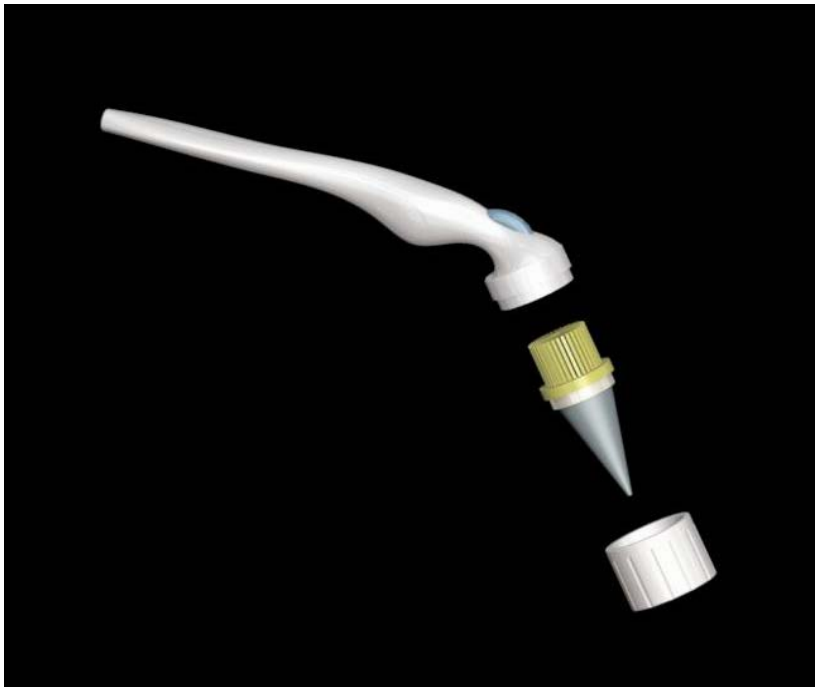
resulted from Cost Reduction Brainstorming

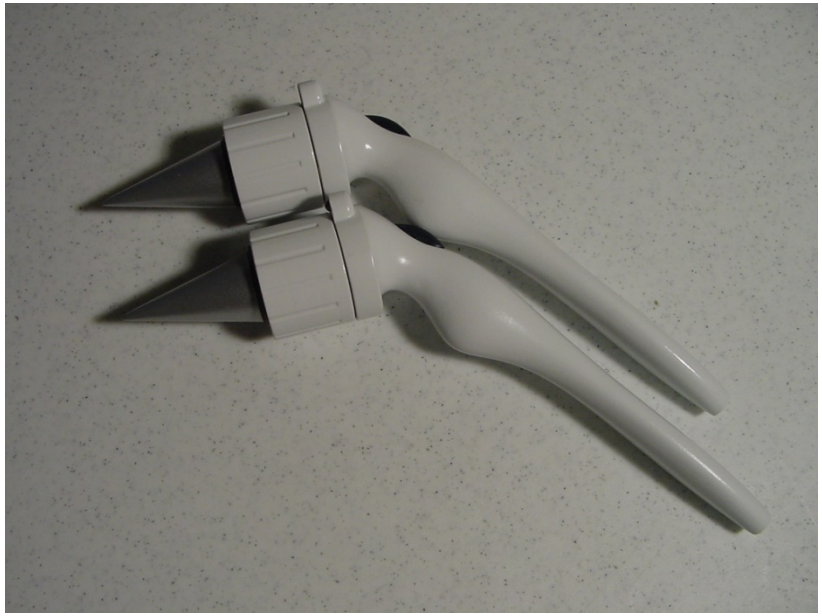
RTV Molding

Fully functional prototypes for field testing

Pfizer Case Study

Creare inc.
Ultrasonic Surgical Transducer





Gill Sports, Urbana
Track & Field Wind Gauge

Hon Industries
Home Office Chair

University of Illinois Team

William Bullock, Industrial Design
Dr. Michael Philpott, Mechanical Engineering
Do Sun Shin, ID
Sebastian Schrader, ME
Tom Philpott, ID, ME

Product Interaction Research Laboratory (PIRL)
University of Illinois Urbana-Champaign

Agenda

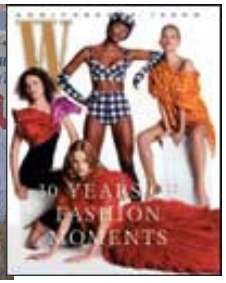
- Project review
- Market Research
- Ideation
- Initial Concepts
- Proof of concept test models
- Final concepts
- Final design
- Cost estimate
- Discussion

Market Research

- Demographics and Telecommuting
- Personalization and Ergonomics
- Innovation
- EchoTech
- Manufacturing
- Interiors
- Aesthetics
- Color
- Alternative Concepts

Demographics

- Dramatic growth of middle age population
- Decline in household size
- Growth of single and two person households



- Growing diversity
- Dramatic growth of sunbelt population
- More sophisticated offices in new and remodeled homes
- In-home services for aging residents

Telecommuting

- 4.2 million telecommute Michael Caggiano, CEO True Careers
- 35% of these work at home at least half of the week
- Provides flexibility, spend time with family, eliminates stressful commute
- Growing in popularity

Personalization

- Individuality/Personalization important
- New product lifestyle is unobtrusive
- Ergonomics increasingly important

Ergonomics

- Chair and work surfaces that are friendly to workers
- Europeans are raising the bar
- Workplace napping; theme: make relaxation and rest an integral part of everyday working life

Innovation

- Innovation is expected
- Consumers want something new
- More features at lower price; more for less
- Adjustment features on chairs a commodity
- Mass merchants launch designer lines
- New products toward funky and functional
- Large wheels roll better

Echo-Tech

- Ecologically conscious products
- Interest in natural materials to counter the influx of technology in our lives
- Appreciation for natural materials
- Advancements in material and production technologies creating new interest
- Metallic polypropylene chips abandoned for reconstituted wood fibers and biodegradable resins

Manufacturing

- Quest for most comfortable cheapest chair
- Natural material to counteract cold technology
- Technology is enabling products
- Increased competition;overseas manufacturing
- Dissociation between well designed and well manufactured
- Risk of compromising quality and integrity
- More features at lower price; more for less
- Pressure on manufacturers to be sustainable

Interiors

- Consumers have more options of style, prices, finishes and colors
- Basic styles: Casual, Formal, Contemporary, Traditional
- Styles: French Country, Paris Apartment, Rustic, Shabby Chic, Tuscan and Western
- Color themes: b & w; chocolate browns and denim blues
- More options for decorating ; wire and wicker popular
- Possible blurring of lines between home office chair and computer chair; Kitchen aesthetic a possibility
- New lifestyle is comfortably understated; unobtrusive

Interiors

Interiors

Aesthetics

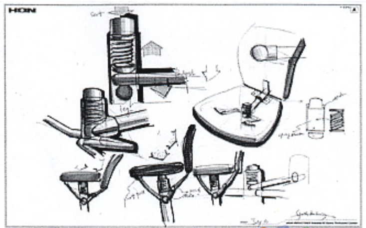
- Shifting US aesthetic; "new modernism of crispness and sharpness; sharp edges, tight corners and straight lines.
- Renewed appreciation for quality and enduring aesthetics
- “Away from rounded see-through forms of the 90‘ and toward a tougher sensibility” Bruce Nussbaum, Businessweek
- Consumers appreciate understated products
- Asian influence increasing
- 2002 Ford Taurus and Lincoln Navigator typical
- Natural material to counteract cold technology

Color

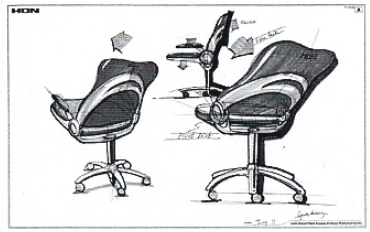
- Consumer product colors are darker and bolder
- Stainless is now a color; titanium increasingly popular
- Nickel is becoming very popular
- Satin metal finishes are in
- Home interior: Black and white, chocolate browns and denim blues
- 80 “staple” colors

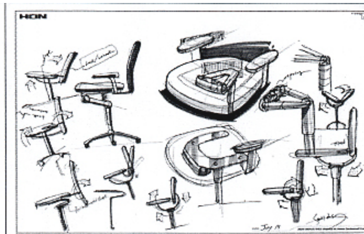
Image Map

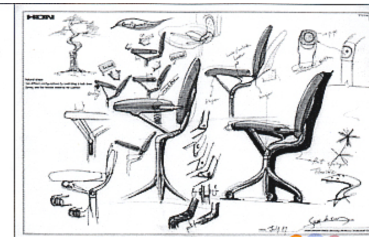
Sketch Ideation (aka - Idea Development)

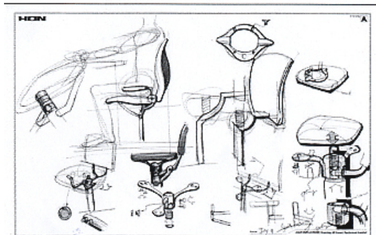


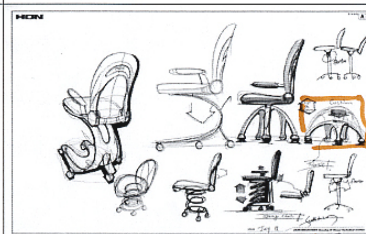
Comment

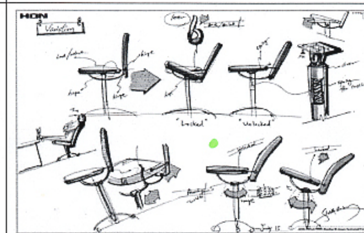


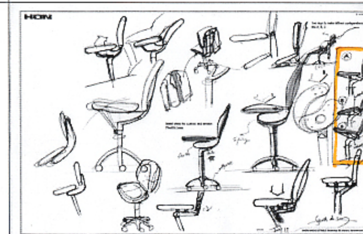


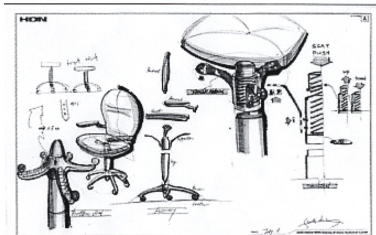


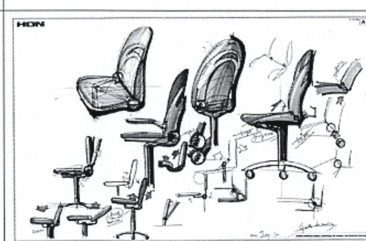


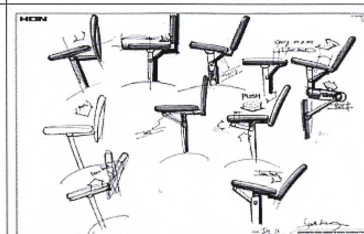


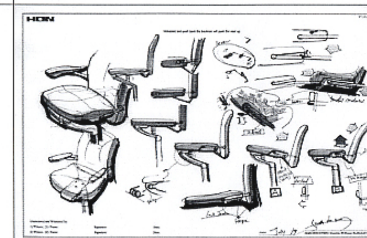


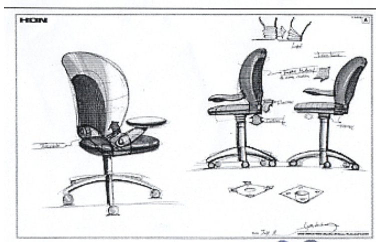


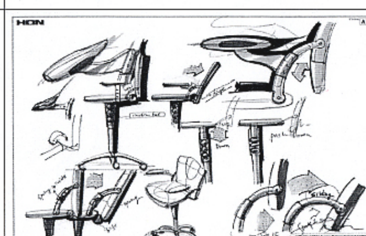


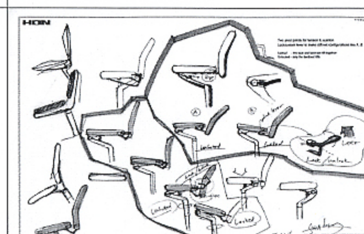


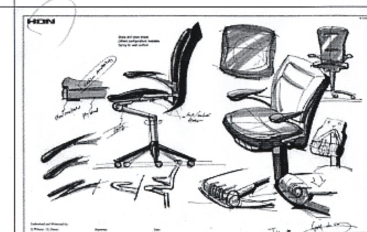




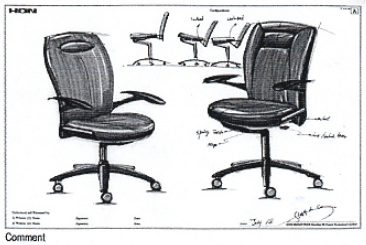




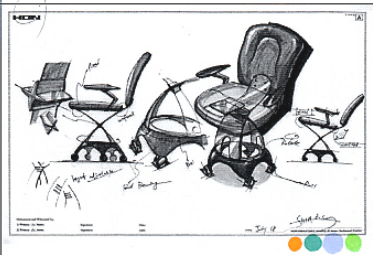


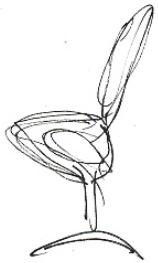


Do Sun Shin

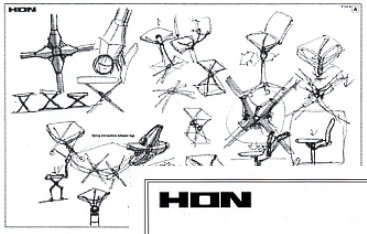

HON

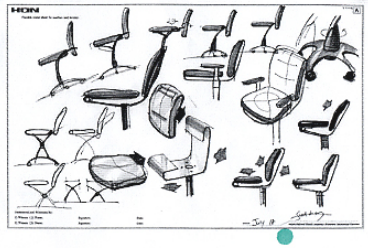
Comment

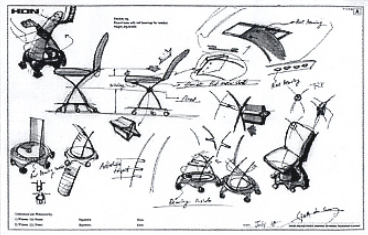

HON




HON


HON


HON


HON


HON
TYPE B
HON
HON
Adjustable Back
Date
HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE B

Date .....

HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE B

Date .....

HON INDUSTRIES Stanley M Howe Technical Center


HON
TYPE A
Configuration
Locked
Unlocked
Sliding
flexible material
Lock/unlock lever
hinge
hinge
pipe
Top view
section
move on a rail
flat spring
flexible
pivot
Date July 17
HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE A

Understood and Witnessed by:

1) Witness (1): Name: Signature: Date:

2) Witness (2): Name: Signature: Date:

Date July 17

HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE A

Understood and Witnessed by:

1) Witness (1): Name: Signature: Date:

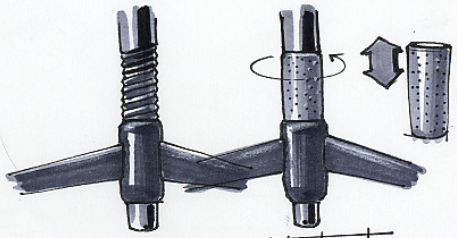
2) Witness (2): Name: Signature: Date:

Date July 18

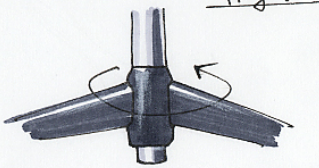
HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE A



Height Adjustment



Silicone pad

Spring provides seat cushion

Date

HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE A

16

Date Aug. 6

HON INDUSTRIES Stanley M Howe Technical Center

HON

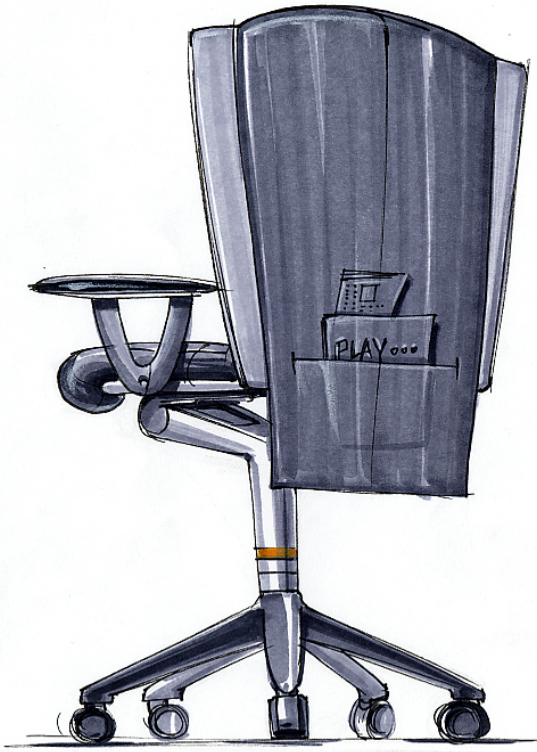
TYPE A

Date Aug 8.

HON INDUSTRIES Stanley M Howe Technical Center

HON

TYPE A



Date Aug. 9

HON INDUSTRIES Stanley M Howe Technical Center

Initial Concepts

- Simple
- Absorb
- Spring
- Uno
- Joint
- Maestro

Simple

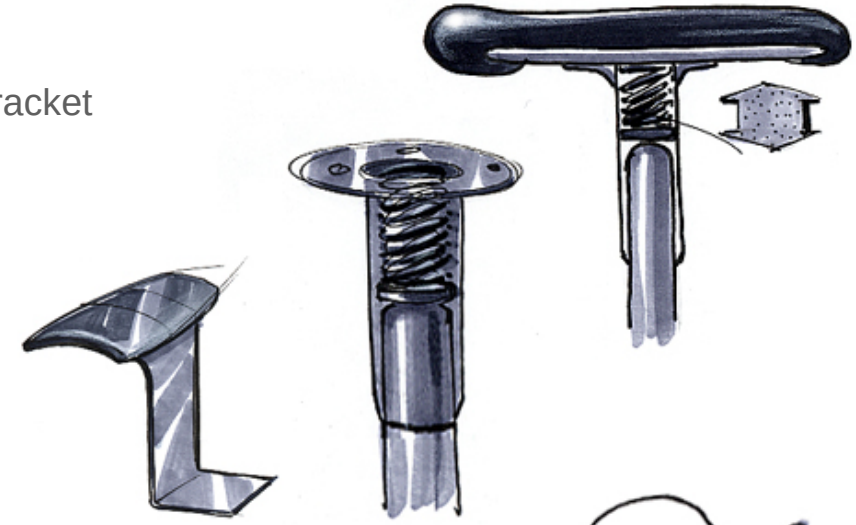
- Height adjustment with column of rings
- Tilting achieved with flexible mounting bracket

Absorb

- Utilizes existing tubing capabilities
- Height adjustment with large threaded shaft/collar
- Forward seat pivot
- Off the shelf parts used to create a new look

Spring

- Coil spring seat support for shock reduction
- Height adjustment with rings
- Tilting achieved with a spring steel mounting bracket
- Head could be detachable



Uno

- Minimal number of parts
- Variable spring rate to accommodate different users
- New look of integral molding for main structure
- Ball casters with recirculating bearings

Joint

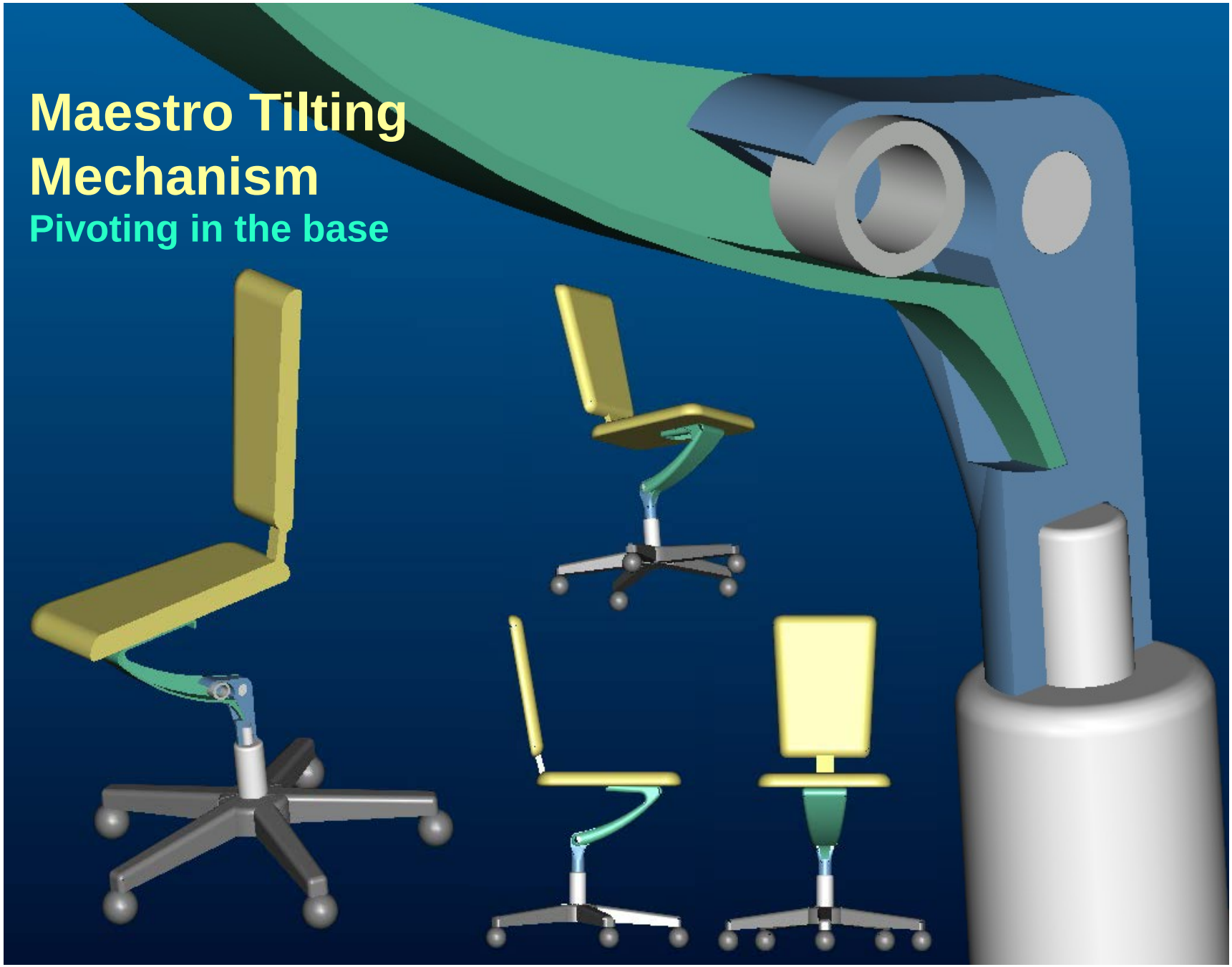
- Blow molded backrest
- Cushion inserts into backrest
- Integrated neck rest
- Height adjustment with pin and holes

Maestro

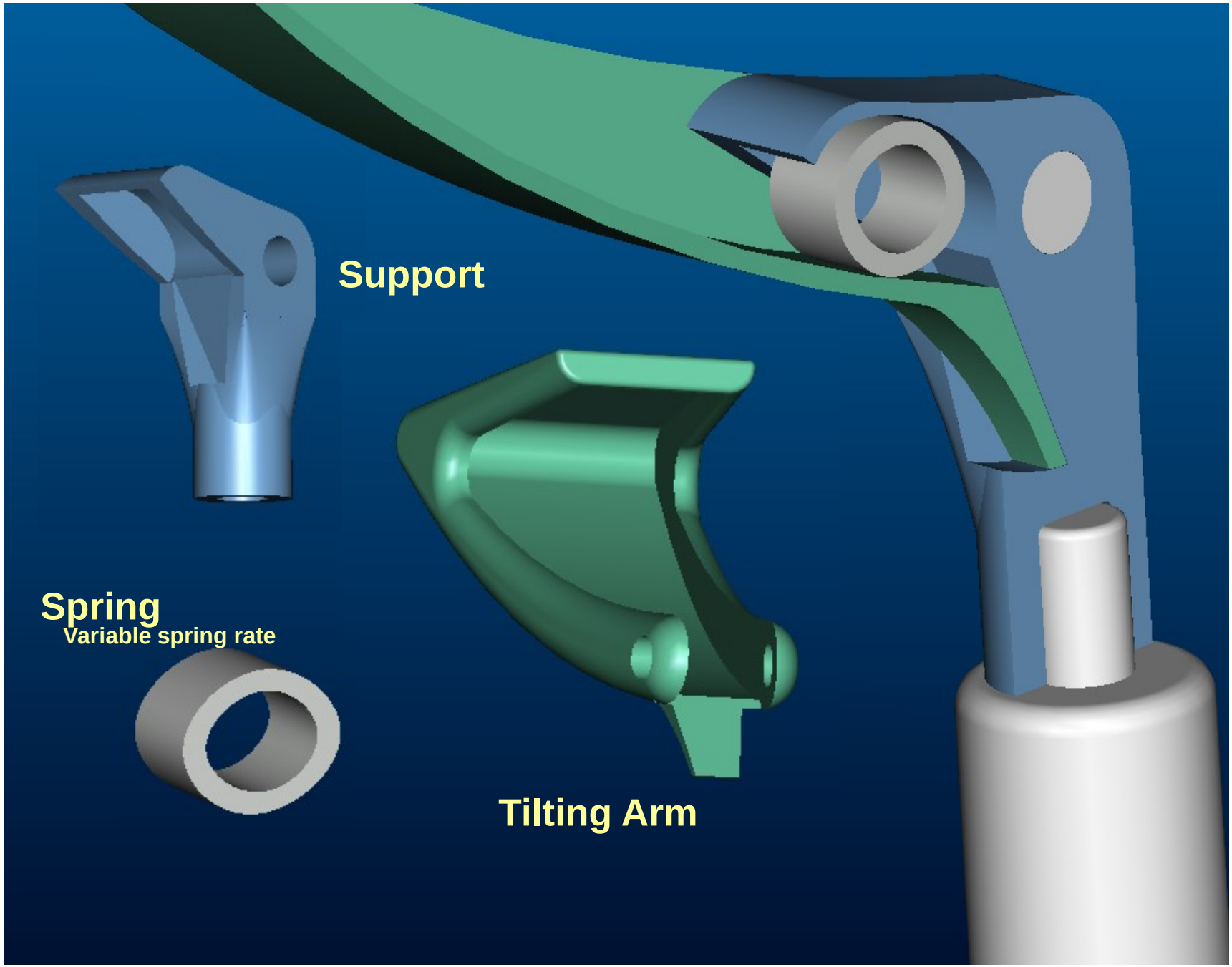
- Elegant tail look
- Height adjustment with column of rings
- Forward seat pivot
- Backrest storage pocket

Maestro Tilting Mechanism

Pivoting in the base



Maestro Under Load


Support
Spring
Variable spring rate
Tilting Arm

Final Concepts

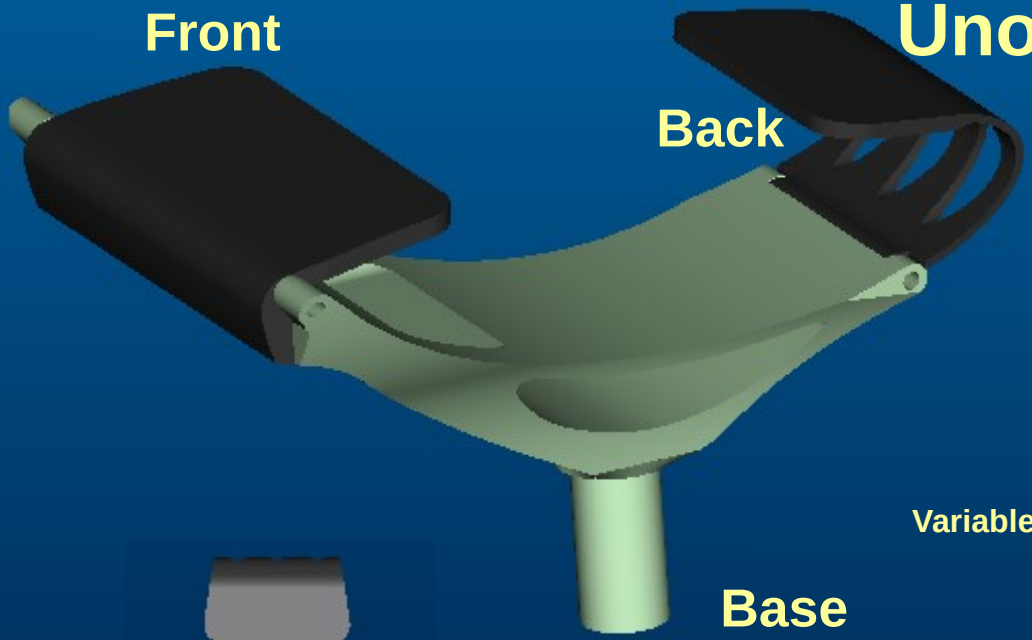
Uno

Joint

Absorb (Shock)

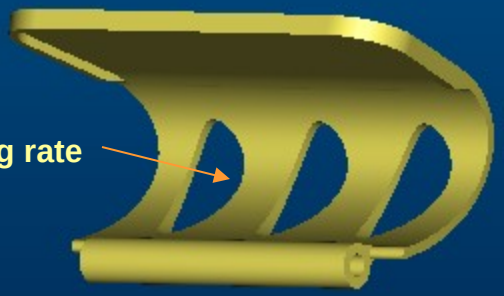
Uno

Uno Tilt Mechanism



Base

Variable spring rate



Polypropylene
Back Spring

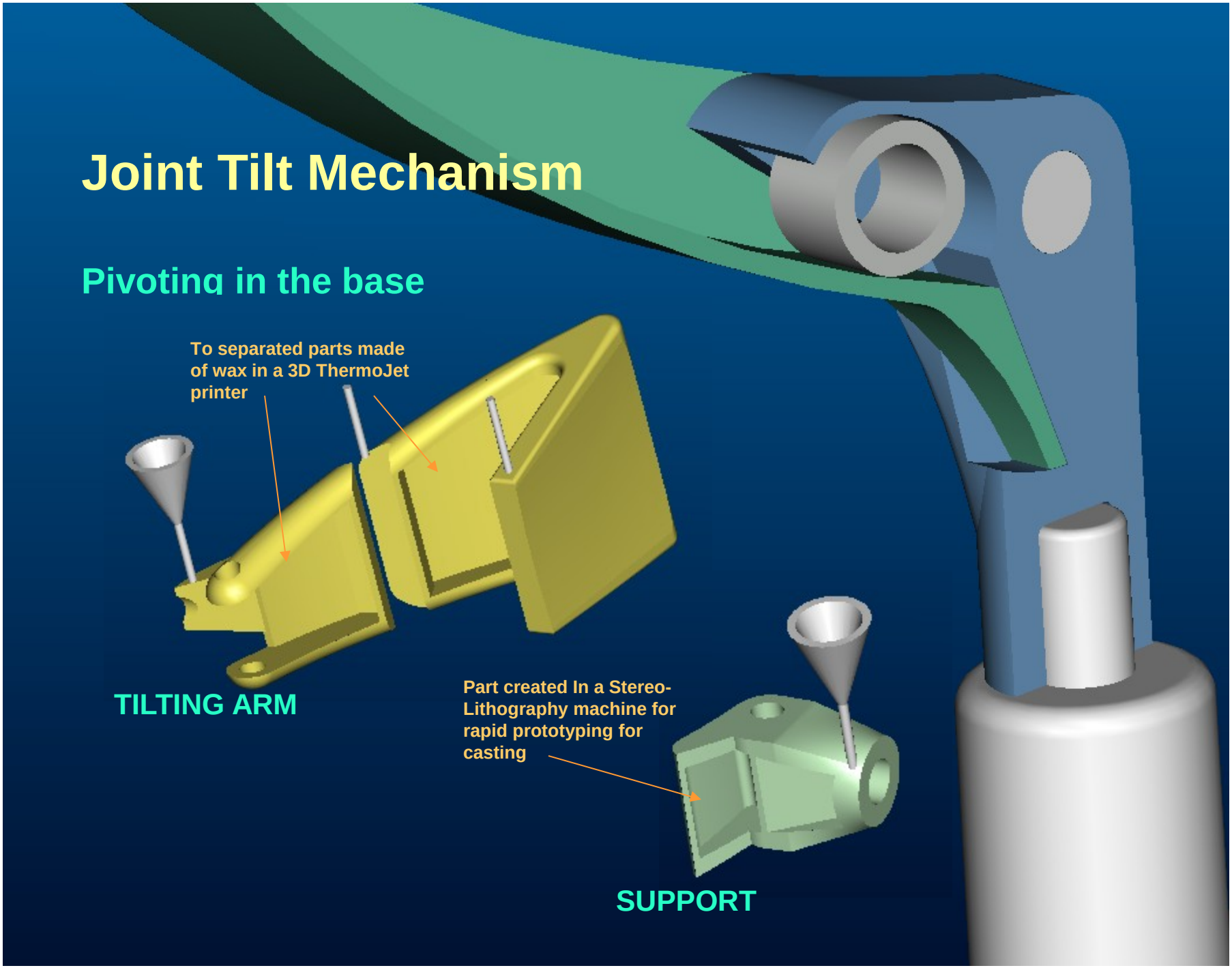
ABS Front: adjustable
for initial conditions

Uno

Joint

Joint Tilt Mechanism

Pivoting in the base



Joint

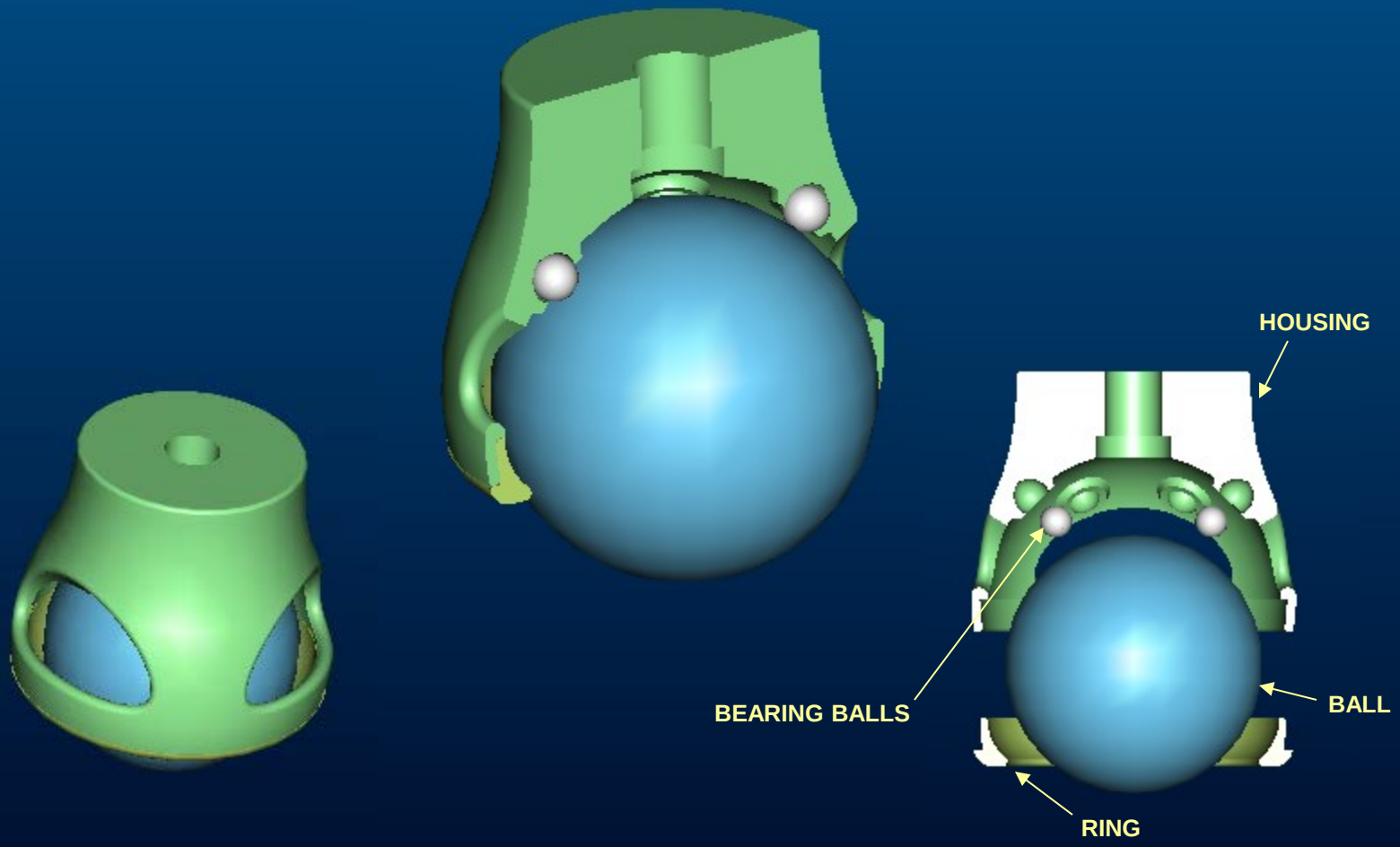
Absorb

Absorb

Ball caster concept (any chair)

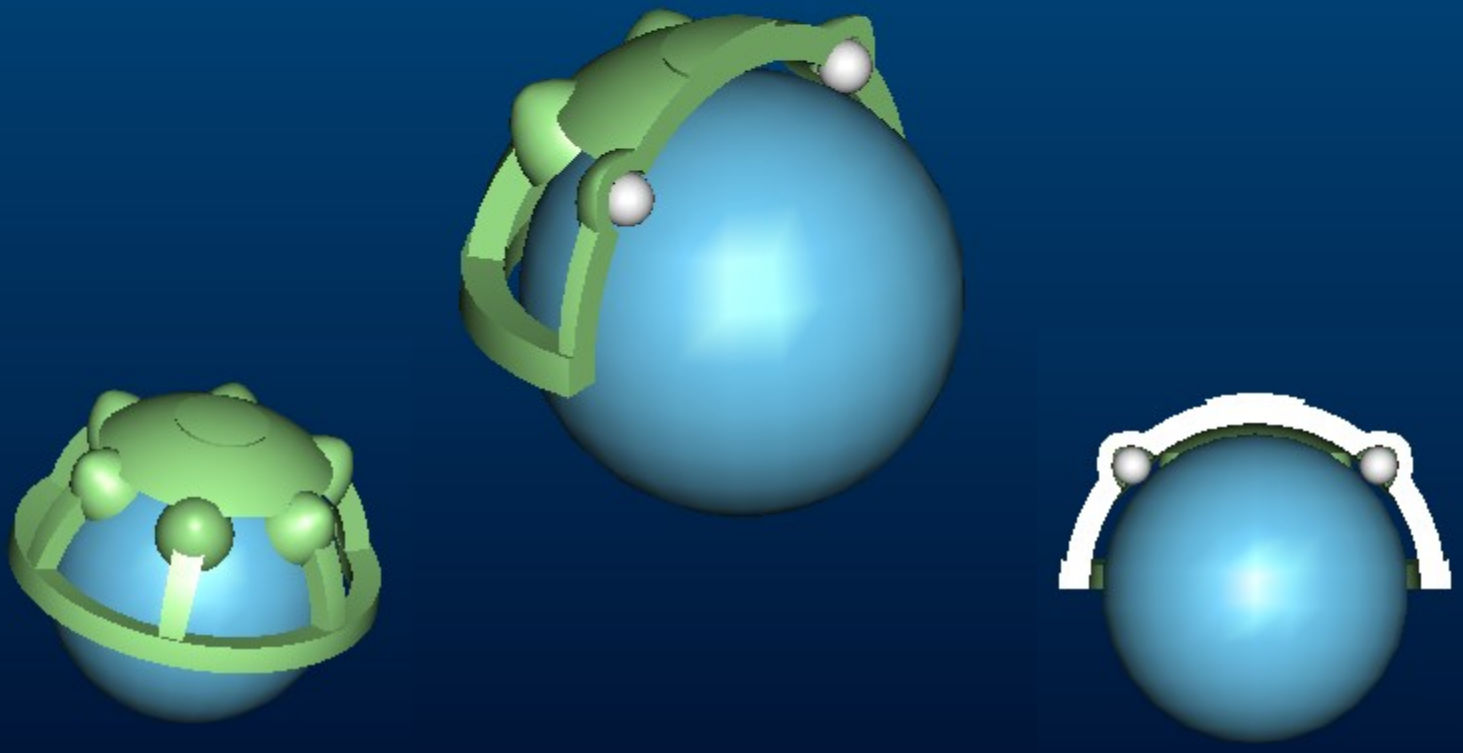
Ball Casters

Four bearing balls



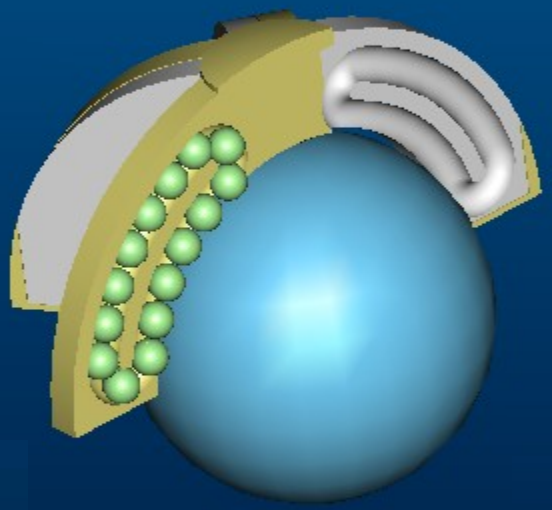
Ball Casters

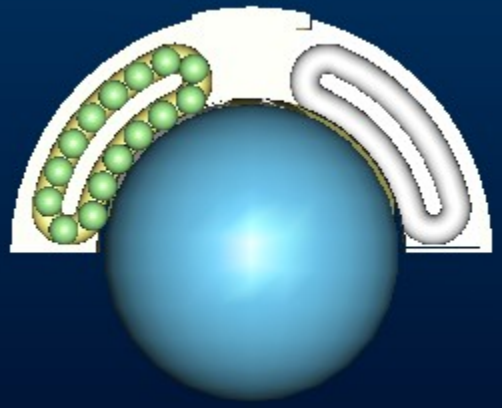
Six bearing balls sliding in elliptical housing



Ball Casters

Re-circulating bearing balls





Final Design Selection

Uno

Joint

Absorb (Shock)

Joint

Joint

Joint

Joint

Joint

Joint

Piece Part Costs:

Seat to Backrest bracket:	$1.35
Control unit support: (CR Steel)	$5.50
Control unit arm + cover:	$7.44
Elastomeric Spring:	$0.80
Hinge pin: (TEKSPAC-Miner)	$1.00
4700 base, casters, + standpipe	$5.72
Cylinder (3.15” stroke)	$2.29
Seat	$6.00
Backrest	$4.91
Outer back cover	$3.73
Total piece part cost:	$38.74

Joint

Tooling Investment

- Seat to Backrest bracket (Die Set) $33,000
- Control Unit Support (2 plate mold, 2 moving side cores) $31,000
- Control Unit Arm (2 plate mold, 2 moving side cores) $42,000
- Control Unit Cover (2 plate mold) $18,000

All single cavity tooling

Total tooling investment: $124,000

2yr. Payback: 26,000 units 1st year

27,000 units 2nd year

Add $2.34 cost per chair

Joint

Good: $89

- Leather + all other fabric coverings
- Height adjustable
- No armrests
- No tilt lock
- Standard casters

Better: $119

- Leather + all other fabric coverings
- Height adjustable
- Standard casters
- Arm rests
- No tilt lock

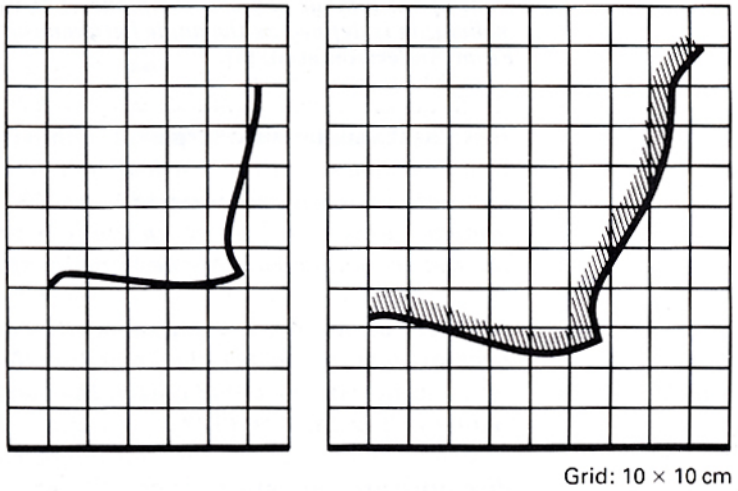
Best: $139

- Leather + all other fabric coverings
- Height adjustable
- Height adjustable arm rests
- Tilt lock
- Upgraded casters

Joint

Human factors

Etienne Grandjean “Fitting The Task To The Man”



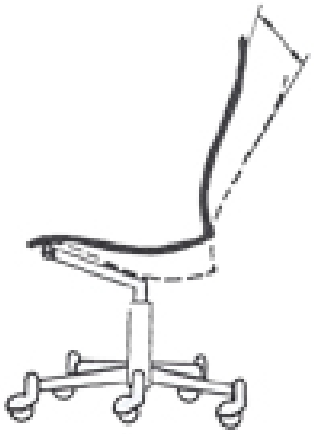


Figure 52. Seat profiles of a multi-purpose chair (left) and an easy-chair (right) both of which caused a minimum of subjective complaints.
Grid 100×100 mm. After Grandjean et al. [90, 92].

Recommendations:

- Backrest height of 480-520mm (18.9-20.4”) above seating surface
- Backrest width of 320-360mm (12.6-14.1”)
- Backrest angle of 104-120 degrees
- Lumbar between the third vertebra and sacrum, 100-200mm (3.9-7.8”) above seat
- Seat width of 400-450mm (15.7-17.7”)
- Seat depth of 380-420mm (14.9-16.5”)
- Seat angle or 4-6 degrees