Motivation

Helicopter pilot
Engineering Design
Challenge
Interesting technology

Core market segment
Aged products
Disatisfied customers
Innovation potential
History

Marenco AG Engineering, Consulting

- Concepts
- Design
- Prototypes
- Simulation
- PLM
- CAD Training
- CAD Methodics
- CMII

Marenco Swiss Helicopter

Since 1987 the idea of an own built helicopter has grown, becoming reality in 2009 with the founding of the company.
## Project

### Four Key Pillars of the Project

<table>
<thead>
<tr>
<th>Product</th>
<th>Company Approvals</th>
<th>Infrastructure</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKYeSH 09</td>
<td>EASA, BAZL</td>
<td>Infrastructure</td>
<td>Company</td>
</tr>
<tr>
<td></td>
<td>DOA</td>
<td>Office Building</td>
<td>Staffing</td>
</tr>
<tr>
<td></td>
<td>POA</td>
<td>Testing</td>
<td>Structures</td>
</tr>
<tr>
<td></td>
<td>MOA</td>
<td>Infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOA</td>
<td>Production</td>
<td></td>
</tr>
</tbody>
</table>

- **Project Facts:**
  - Officially started Jan 1st 2010
  - From 7 employees to 120 FTE’s in 2016
  - Two main locations (Mollis Airport, Pfäffikon ZH)
  - Two side locations (Munich, Johannesburg)
Pfäffikon ZH

Projectmanagement, Design, Engineering, Procurement
Mollis - Näfels

Pre Assembly, Final Assembly, Flight Testing, Stock
Ennetmoos, South Africa, Germany

Ennetmoos Testing

Marenco South Africa Dynamic Windtunnel

Marenco Germany Certification
Infrastructure

Whirl Tower Gearbox Testbench
Management Team

CEO
Martin Stucki

CQO
Arndt Lapice

CFO
Marcel Klaus

Sales Director
Mathias Senes

CTO
ai Martin Stucki

COO
Bruno Gubser

Project Management
Mike Schneider
The main population of civil light single turbine helicopters concentrates on the Western Hemisphere....

Source: Bart Fleet Report 2014
Honeywell 2015 updated forecast confirms segment, regions and application focus

5,250 Turbine Helicopters
2,550+ Light single-turbine

510+ single-turbine deliveries per year over the next five years

Focus for MSH until 2020

General Utility, Passenger transport, Law enforcement usages represent 73% of the overall market and certainly more on the single turbine sector

*Source: 17th Annual Honeywell Survey
The US Market represents the single largest market with 10’055 aircraft

**10’055 Helicopters**

From the piston RH22 to the S92A by Sikorsky

- 3’292 Piston helicopters (32%)
- 5’100 Single Turbine helicopters (51%)
- 1’663 Twin Turbine helicopters (17%)
- 6’763 Turbine Helicopters

23 YEARS

An ageing civil US fleet offers a significant potential for renewal
The overall European market population for single turbine helicopters is 2’083.

6’455
Turbine and Piston Helicopters in Europe

4’243
Turbine Helicopters
50% 50%

2’083
Single Turbine helicopters

2’212
Piston Helicopters

2’160
Twin-engine helicopters

17 YEARS
Similar to the US, Europe has an ageing civil fleet that will require replacement.

19.8 years for the light single-engine fleet.

Source: Bart Fleet Report 2014
© Marenco SwissHelicopter AG | Bruno Gubser
Airbus Helicopters is the clear leader in turbine production numbers

**Market Leaders**

- **AIRBUS HELICOPTERS**
  - 31%
  - 479 a/c

- **RUSSIAN HELICOPTERS**
  - 19%
  - 290 a/c

- **ROBINSON HELICOPTER COMPANY**
  - 13%
  - 192 a/c

- **AgustaWestland**
  - 13%
  - 200 a/c

**Endangered Industrials**

- **MD HELICOPTERS**
  - 2%
  - 25 a/c

- **KAMAN**
  - 0%

**Developing Industrials**

Global Turbine Production of 1526 aircraft (2013)

Source MSH 2014

© Marenco Swisshelicopter AG | - Strictly confidential -
Airbus Ecureuil clear leader on the segment – driving the MSH prospect base

**Ecureuil AS350 / EC130**
- **1970 Design**
- **1974 First Flight**

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS350 B/D/BA/B1</td>
<td>929 units</td>
</tr>
<tr>
<td>AS350 B2</td>
<td>1 188 units</td>
</tr>
<tr>
<td>AS350 B3/B3+/B3e</td>
<td>1289 units</td>
</tr>
<tr>
<td>EC130 B4</td>
<td>445 units</td>
</tr>
</tbody>
</table>

**TOTAL AS350 – EC130**
3 851 units

**Bell 407**
- **1970-74 Designed from B206**

**Bell 206L**
- **1970-74 Design**

**BELL 407/407Gx**
1 186 units

**BELL 206L /L1/L3/L4**
1 835 units

**TOTAL: 6 872 units**
An additional opportunity with aircraft at the end of life – MD and AW prospects low hanging opportunities

**Koala AW 119**
- Designed from A109
- 1967-71
- 93 units
- 88 units

**MD600**
- 1963-76
- Designed from the 369HS
- 65 units

**High Performance / Niche Market FLEET at life end**

- **AEROSPATIALE SA 315/316/318/319**
  - EUROCOPTER
  - 441 units

- **BELL 204/205/214**
  - BELL
  - 388 units

**Renewal opportunity for fleet at life end**

**TOTAL: 1 075 units**
Competition summary – MSH is entering an attractive segment which main competition are not putting focus on

<table>
<thead>
<tr>
<th>Light single-engine</th>
<th>Light twin</th>
<th>Heavy &amp; Intermediate twin</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-seater</td>
<td></td>
<td>Bell V280 - in development</td>
</tr>
<tr>
<td>Bell 505 - 2018</td>
<td></td>
<td>EC135/145 (X9) - new platform</td>
</tr>
<tr>
<td>Bell 407.. Bell 417 - 2025 (not planned)</td>
<td>AS355 - stopped</td>
<td>EC175 - recently launched</td>
</tr>
<tr>
<td>Bell 429 - in operation</td>
<td>AS350 - JV concepts w/ Russia, India &amp; China</td>
<td>EC225 (X6) – replacement in development</td>
</tr>
<tr>
<td>Bell 412 - no upgrade plan</td>
<td>AS350 - new platform - 2025</td>
<td>AW109 - end of life</td>
</tr>
<tr>
<td>Bell 525 - in development</td>
<td></td>
<td>AW109 - new platform - 2020</td>
</tr>
<tr>
<td>Bell 505 - 2018</td>
<td>AW119 - no new platform</td>
<td>AW109 - new platform - 2020</td>
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<td>AW119 - JV concepts w/ India &amp; China</td>
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<tr>
<td>Bell 525 - in development</td>
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<td>AW169 - in development</td>
</tr>
<tr>
<td>Bell V280 - in development</td>
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<td>AW 609 – in development</td>
</tr>
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</table>
Four firm contracts and 83 Letters of Intent signed as of today

MSH fleet repartition

- 46%
- 21%
- 14%
- 13%
- 6%
SKYe SH09 Superior Design Features

- Full Carbon-composite airframe
- 5-Blade MRH
- 1021 hp engine
- No TBO
- Two-stage compressor
- Silent
- Safe
- Full authority
- High Tail-boom clearance
- Superior Field of view
- Glass-cockpit
- Vertical reference windows
- High-ceiling cabin
- Crashworthy individual seats
- Large Cargo-hold Rear-access through Clamshell doors
The SKYeSH09 is not a revolutionary concept, but a bundle of incremental innovations improving dissatisfiers from existing products combined with the use of the latest available technologies and concepts.
Product

Spacy and flexible cabin layout with large doors for superior accessibility, built of carbonfibre for high stiffness.
Roomy luggage compartment with large doors for easy load / unload in upright position e.g. for emergency medical services
Product

High visibility cockpit with superior ergonomics and excellent view for long line applications
While the large players are still trying to solve the fundamentals such as increasing cruising speed...
Technology

.. we care about the obvious improvements such as a 5 arm rotor developed in house, which leads to less vibration and less noise..
Technology

..an own developed highly efficient, compact gearbox, which enables us to outperform competition in the hot and high performance..
Technology

..a main airframe, built of different components, engineered in CAD, which allow size, design and weight optimizations in an early stage...
Technology

Verifikation

Loads
Flightlab
Requirements

Finite Element Method (FEM)

Tests

..supported by calculation and simulation in order to shorten the development time...
..and supports innovative designs and manufacturing methods for attractive costs.
September 2014 100% RPM
An important step towards first flight
First Flight P1  October 2nd 2014
First Flight P2 February 26th 2016
Heli Expo 2011 - 2016
First signed contract at HAI 2016 – Air Zermatt

A huge success
<table>
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<tbody>
<tr>
<td>Motivation, History, Company</td>
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<tr>
<td>Opportunity</td>
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<tr>
<td>Solution, Product, Technology</td>
</tr>
<tr>
<td>Outlook</td>
</tr>
</tbody>
</table>
Company approvals strategy 2015-2018

- Adjusted in January 2016
- This strategy defines the priority and sequence until 2018
Certification Status

EASA TC planned for Q2 2017

**EASA**

- TC activities started in 2010 parallel to the experimental built
- Integration of former Airbus Helicopter Certification team into MSH in 2012
- CVE of MGE (daughter company of MSH) cover all disciplines of SKYe SH09
- Close cooperation of the MSH team leads and the CVE’s with the corresponding EASA panel experts over the whole DO process.
- Appointment of dedicated and extremely experienced specialists for all the process and organisational certification.
- Monthly meetings with EASA to push TC

**FAA**

- Early involvement of FAA through Wayne Barbini as former chief of certification of Bell Helicopter
- FAA got an in depth briefing on the program during their visit last year in June.
- Continous meetings with FAA e.g. at HAI 2016
- Requested FAA for checking FAA add ons for certification in Q3.16 at Pfäffikon
## Market Entry Strategy 2020 – Key Pillars

<table>
<thead>
<tr>
<th>Product</th>
<th>Markets</th>
<th>Applications</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKYeSH09</td>
<td>Central Europe first 10 launch Customers</td>
<td>Utility</td>
<td>2017</td>
</tr>
<tr>
<td>SKYeSH09</td>
<td>Central and Western Europe US</td>
<td>Utility Sightseeing</td>
<td>2018</td>
</tr>
<tr>
<td>SKYeSH09</td>
<td>Central and Western Europe US, Canada, Oceania</td>
<td>Utility EMS Executive Transport</td>
<td>2019</td>
</tr>
<tr>
<td>SKYeSH09</td>
<td>Central and Western Europe US, Brazil, China, Japan</td>
<td>Utility Sightseeing EMS Executive Transport</td>
<td>2020 - 2021</td>
</tr>
</tbody>
</table>
Customer support follows market entry

**2016 - 2017**
- **Phase 1: EUROPE (Western)**
  - First 30x Helicopters
    - Support from Switzerland
    - Hotline Technical assist.
    - Field Representatives
    - Part 145 Training Center
    - Part 147 Training Center
    - Part ORA Training Center

**2017 - 2018**
- **Phase 2: USA (FAA) & EASA countries**
  - Next 60x Helicopters
    - Support from Switzerland
    - Hotline Technical assist.
    - Field Representatives
    - Appointment of (external)
      - + Service Centers in USA
      - + Service Centers in Europe

**2018 - 2019**
- **Phase 3: OCEANIA, JAPAN, ASIA + FAA & EASA countries**
  - Next 100x Helicopters
    - Center of Competence in Switzerland
    - MSH office in USA
    - Appointment of (external)
      - ✓ 5x Service Centers in Oceania & Japan
      - + Service Centers in China & SEA

**2019 - 2020**
- **Rest of the World: CANADA, BRAZIL**
  - Next 260x Helicopters
    - Centers of Competence
    - MSH office in USA
    - MSH office in Asia
    - Appointment of (external)
      - + Service Centers in Canada, Brazil, SAF, ME
      - + Training Center (USA)
Green field allows to plan lean for assembly – reduction of lead time and costs

**Final Assembly – In 10 Steps to the final product**

- With the given layout 120 helicopters/annum can be produced
- Number of employees for assembly only 22
- Area needed around 1800 sqm
- Lead time 154 h, delivery of 1 helicopter every 2 days

**Gear Pre Assembly – Modular capacity for new products and MRO**

- With the given layout 120 gear boxes for new products plus 187 MRO can be handled
- Number of employees for assembly and MRO 12
- Area needed around 500 sqm
- Lead time every 2 days a new set of gear boxes and/or MRO gear boxes will be delivered