Evaluation of HGU-56/P Flight Helmet

Center for Man in Aviation
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Ideal helmet
Remarks
Royal Netherlands Air Force
Evaluation HGU 56/P helmet
Introduction

Intensive use of the helmet in Afghanistan
- Average 4-6 flight hours per week Netherlands
- Average 20-24 flight hours per week Afghanistan

Increase in complaints about helmet
- Stability
- Comfort
- Inner liner (hot spots)
- NVG
- CEP (Communication Ear Plug)
- Ear cushions
Methods

• Questionnaire
  • Stability
  • Ease of use
  • NVG
  • CEP
  • Inner liners
  • Visor
  • Ear cushions

• Interviews
• Manuals
• Noise attenuation
• Ergonomic research
• Future development
Results I
Fit & Comfort, Inner liners, Ear cushions, Stability

- Dissatisfaction about helmet fit and comfort
  - Unclear fitting process
  - Inadequate helmet fitting
- Helmet instability
- Hot spots
- ~50% reported helmet as being “quite heavy”
- No ventilation (warm)
- Ear cushions
- Insufficient helmet sizes
- Complaints about the Thermo Plastic liner (TPL)
- ~50% uses uncertified ZetaLiner

Actions: introduction new fitting process, testing new innerliners
Interviews

Example stability:

"I started with a helmet one size larger and after 1,5 years, i got one size smaller. When i was flying with the larger helmet, i needed much more counterweights just to keep the helmet in place, now i could do without a CW (...) although it is still more comfortable to use a CW because of the better weight distribution, but i do not need it anymore to keep my helmet in place" (LM03)

Example comfort:

"The helmet wants to turnover no matter how much you tighten the napestrap. OK, it helps a little to tighten the napestrap, but if you really tighten it, it feels awkward in your neck, so that is really no option" (LM10)
Bottlenecks

- Edge of absorber liner
- Nape strap / retention system
- Restricted head movement with snug fit nape strap
- Non-symmetric pressure ear cushions
- Visor down with NVG not possible
Results II
User friendliness/ Ease of use

• Good
• Visors easy to use
• Problems with boom mic
• Problems with chinstrap
• Bad protection against dust
• Abstraction visual field (sides)

• Actions: change of chinstrap and visors
Results III
Noise attenuation

![Chart showing noise attenuation of HGU-56/P helmet](image)

Table 2 noise exposure of the loadmaster under the helmet in the Chinook (back of the Chinook) (111 dBA).

<table>
<thead>
<tr>
<th></th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>8kHz</th>
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<tbody>
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<td>Gentex user fit</td>
<td>73</td>
<td>83</td>
<td>80</td>
<td>74</td>
<td>70</td>
<td>71</td>
<td>67</td>
<td><strong>86</strong></td>
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<tr>
<td>Gentex user fit + V-CEP+ custom earplug</td>
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<td>69</td>
<td>65</td>
<td>70</td>
<td>61</td>
<td>54</td>
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<tr>
<td>Gentex expert fit + V-CEP+ custom earplug</td>
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<td>71</td>
<td>60</td>
<td>51</td>
<td>50</td>
<td><strong>75</strong></td>
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</table>
Vented CEP + custom molded earplugs
Results IV
Noise attenuation, speech intelligibility and CEP

• Single hearing protection - Insufficient noise attenuation
  • Adequate helmet fitting improves attenuation

• Double protection (HGU-56P+CEP) - sufficient attenuation

• CEP - Good speech intelligibility

• Complaints comfort CEP

• Action:
  • Better helmet fitting
  • Integration of CEP in custom molded earplugs
Results V
Ventilation

• inadequate ventilation
  • Uncomfortably warm
  • “the feeling of decrease in performance”

• Proposal: research other inner liners for improved cooling, air cooling for helmet

• Ongoing research- comparison of different inner liners
Results VI
Night Vision googels

- Poor stability
- Use of counterweights (CW)- 200-400g
  - Stability improvement
  - Decrease in neckload
- Total configuration helmet+ NVG+ CW= heavy

Action: integration of NVG into fitting process
  - Improve stability
  - Improve comfort?
  - Decrease neckload?
Ideal flight helmet according to aircrew I

• Task related factors
  – No obstruction of the visual field
  – Protection of face, eyes, head and hearing
  – Good communication possibilities
  – Won’t cause any head movement constraints

• User related factors
  – Good thermoregulation properties
  – Good fit and size options
  – Stability and no gliding of the helmet
  – Weight as less as possible
  – One unit in all configurations / compatibility
  – Not causing any discomfort
  – User friendly
### Ideal flight helmet according to aircrew II

<table>
<thead>
<tr>
<th></th>
<th>HGU-56P</th>
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<tbody>
<tr>
<td><strong>Task related</strong></td>
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<tr>
<td>No obstruction of visual field</td>
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<tr>
<td>Protection of face</td>
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<tr>
<td>eyes</td>
<td>+ (-)</td>
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<tr>
<td>head</td>
<td>+ (+)</td>
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<tr>
<td>hearing</td>
<td>-</td>
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<tr>
<td>Good communication possibilities</td>
<td>+</td>
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<td>No head movement constraints</td>
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<tr>
<td><strong>User related</strong></td>
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<tr>
<td>Good thermoregulation properties</td>
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<tr>
<td>Good fit</td>
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<tr>
<td>Size options</td>
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<td>Stability</td>
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<tr>
<td>Weight as low as possible</td>
<td>+/-</td>
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<tr>
<td>All in one system</td>
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<tr>
<td>User friendly</td>
<td>+</td>
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*Not being aware of wearing a helmet*
Remarks
The new helmet fitting procedure improved
- Helmet stability with and without NVG
- Noise attenuation

What is the influence of improved fitting on comfort?

Research into other innerliners to improve helmet ventilation
Questions