



Royal Netherlands Air Force

Evaluation of HGU-56/P Flight Helmet



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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"(Im10)



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)
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- Actions: change of chinstrap and visors



Results III

Noise attenuation

Attenuation of the HGU-56/P alone and in combination with custom molded earplugs and Vented CEP

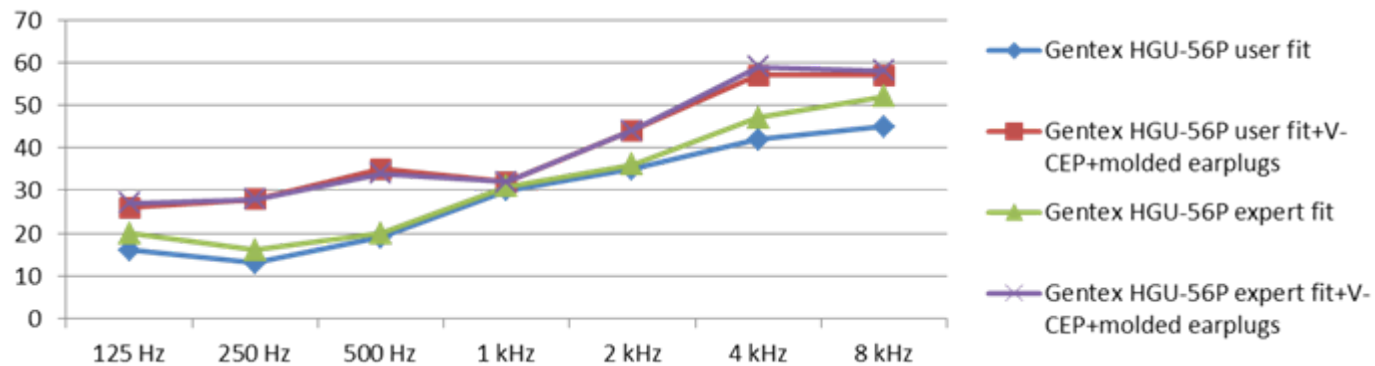


Table 2 noise exposure of the loadmaster under the helmet in the Chinook (back of the Chinook) (111 dBA).

	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	LAeq
Gentex user fit	73	83	80	74	70	71	67	86
Gentex user fit + V-CEP+ custom earplug	64	69	65	70	61	54	52	74
Gentex expert fit	70	80	78	73	68	65	55	83
Gentex expert fit + V-CEP+ custom earplug	64	69	65	71	60	51	50	75



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 goggles

- 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

	HGU-56P
<i>Task related</i>	
No obstruction of visual field	-/+
Protection of face	+ (-)
eyes	+ (-)
head	+
hearing	-
Good communication possibilities	+
No head movement constraints	-
<i>User related</i>	
Good thermoregulation properties	--
Good fit	?
Size options	-
Stability	+
Weight as low as possible	-/+
All in one system	-
User friendly	+

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