

iSLD-IVC: Helicopter Slungload Damping

Swinging or pendulous payloads on helicopters often are leading to dangerous situations, which may not only cause the loss of the payload but also being a significant danger for pilot and crew. Accidents are reported where slung load operating helicopter were damaged or have been lost due to imperfection of even skilled pilots to operate slung loads in difficult environment.

In co-operation between DLR and iMAR, a leading manufacturer of advanced and custom designed inertial measurement systems for navigation, guidance and control, a so-called **Helicopter Flight Director** has been developed. The flight director shows the pilot, how to avoid an increasing of pendulum amplitudes and how to control the helicopter to damp and reduce pen-



dulum motion amplitude within shortest time and even under difficult conditions. The amplitude of the pendulum motion can be reduced within less than 2 time of its period duration to a magnitude being absolutely uncritical for helicopter and payload.

The system being patented world-wide had first been tested successfully on the DLR flight simulator in Brunswick in August 2002. Successful test flights with according hardware have been performed in June 2003/2005 on DLR's BO-105 helicopter. Both BO-105 and simulator flights with many test pilots have shown that also those pilots, which also never had operated slung loads,

where able to stabilise the pendulum load without any special training and where able to fly instable payloads without inducing any pendulum motion. Also artificial induced pendulum motion was compensated by the pilots always in very short time.

The core of the system is an inertial sensor package combined with an advanced image processing which detects the motion of the heli-



copter and the motion of the slung load. From these measurements the flight director is driven. The total system is designed as an autonomous device and it is working independently from the type of helicopter, the mass of the payload and the length of the rope. The power consumption is less than 35 Watt.

iMAR is in process to receive the ETSO approval, which shall be independent of the type of helicopter on which it is used, The system does not contain any moving parts and provides a long operational time.

Techn. Data:

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| Data transmission: | via RS232/422, VGA or Bluetooth |
| Visualisation: | on Glass-cockpit, PDA, tbd |
| Data rate: | 50 Hz (uncorrelated measurements) |
| Illumination: | day light or integrated IR illumination |
| AHRS: | MEMS-based incl. GPS |
| Supply: | 18...34 V DC, 34 W incl. IR, 14 W w/o IR |
| Mass: | 4.34 kg |

For further information please contact www.imar-navigation.de or contact our engineering department.

Flight Campaign Nov 2007 on CH53 at WTD61 in Manching (WTD61 / iMAR)

iSLD Helicopter Flight Director:
PDA or MFD (here: CH53)



System Components:

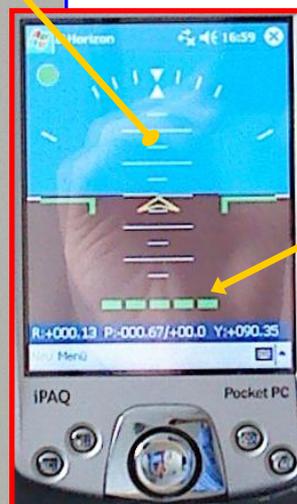
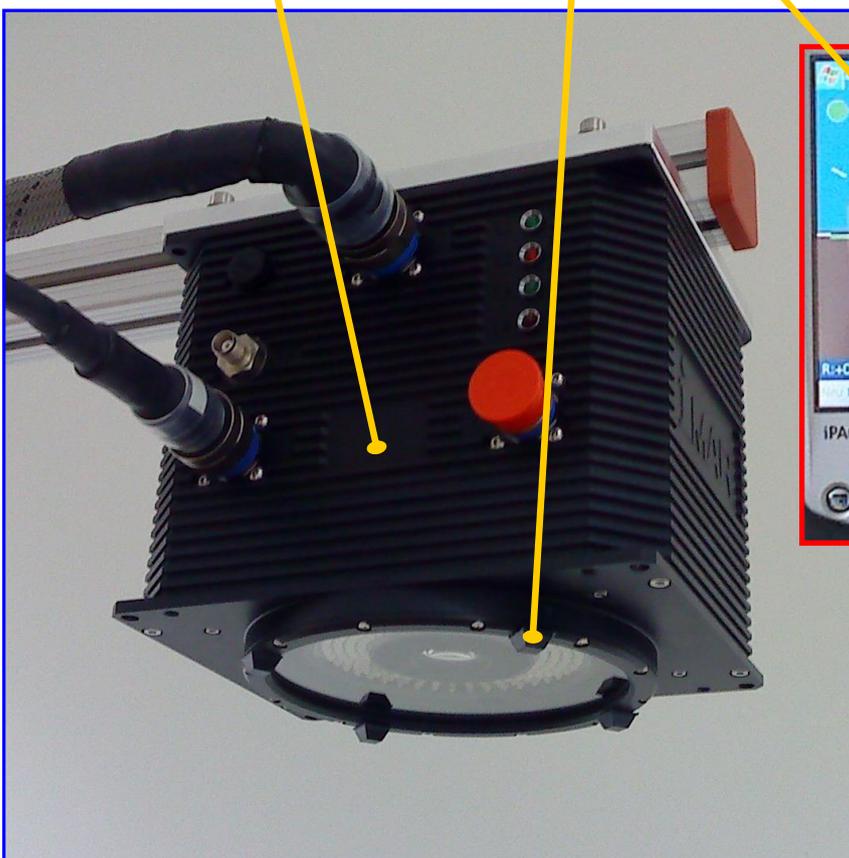
- all parts are fixated at the Helicopter -

iSLD-IVC with integrated camera, IR illumination and AHRS incl. GPS



instabile Payload

PDA (Display)



information regarding the confidence of the displayed motion proposal

optical marker

