

AFV/MBT MODERNISATION WITH DAY/NIGHT DRIVING ASSISTANCE CAPABILITY

FIELD EVALUATION: TECHNICAL VOLUME



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1. Technical description

1.1. Introduction

Expectations from Land Forces regarding Driving Assistance functions are as follows :

- Keep driving and progressing whatever the conditions (day & night vision, poor visibility conditions);
- Strategic positioning in case of emergency situation;
- Emergency breaking and avoidance manoeuvres;
- Rugged, reliable and cost effective shipset, easy to integrate and replace in case of failure.

LHERITIER has therefore being asked to evaluate different systems during field test campaigns, in order to select and provide the most appropriate and cost effective solution.

1.2. System architecture

The selected system architecture is based on the integration of two important parts :

- An optronic block, combining two self-reliant optronic cores (ARTEMIS monochrome module with a 8mm large field optic), providing a high resolution panoramic view of the scene.

N.B. the choice of a full HD monochrome vision (vs color), with 25 images/s, associated to a 8mm optic, is the result of test campaigns.



Fig. 1 : Visual perception of a wet road (color)



Fig 2 : Perception of a wet road (monochrome)

- A restitution block, composed of two displays, each of them receiving 1 HD-SDI video stream.

The videos will be played in native resolution, side by side, without latency.

The optronic cores being synchronized, the simultaneous viewing of the two videos will provide the driver/operator with a panoramic vision.

Due to space constraints in AFV/MBT cockpits, displays with a 5 inches diagonal are more suitable.



Figure 3 : Cockpit overview



Figure 4 : Cockpit overview

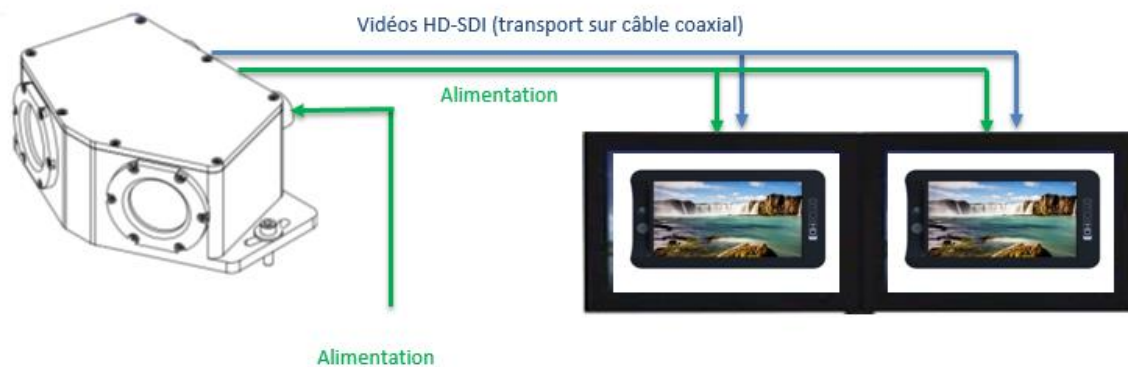


Figure 5 : Synoptic of LHERITIER's solution

1.3. Technical description

a) Optronic block

Developed on the basis of two ARTEMIS Monochrome Modules (2Mpixels Module already qualified and combat-proven on the ANTARES perimetric vision system of the Jaguar and Griffon vehicles of the French Army), the optronic device allows to visualize permanently and with a minimal latency:

- an 150° horizontal field of view (mandatory for safe high speed driving)
- a 47.4° vertical field of view (adapted for safe driving condition at 90KM/h).

A factory calibration will enable to harmonise (geometrically and photometrically) both video inputs simultaneously.

Figure 6 : optronic block, Easy Mechanical Adaptation

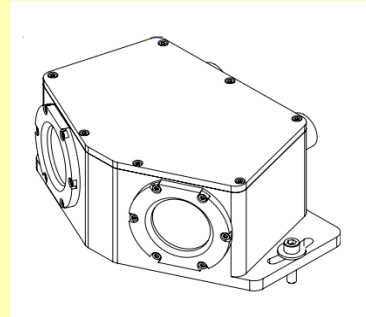
Principal brick :

2 *optronic cores* (modules ARTEMIS monochrome + optic 8mm)

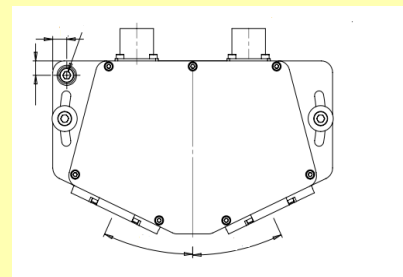
Synchronisation of the 2 optronic cores

With anti-reflective glasses

:
Power : Approximately 14 W



ICD optronic system



For demonstration purposes, the vision capability in poor environmental conditions and at night could be evaluated and validated on the basis of a PILOT camera (which includes an ARTEMIS monochrome module in automatic mode), already qualified and flying on the SAFRAN PATROLLER MALE UAV of the French Armed Forces.



Figure 7 : Visual perception of the wet road, at night with lights on



Figure 8 : Visual perception of the wet road, at night with lights on, when it rains

b) Restitution block

LHERITIER suggests to juxtapose two LCD displays, 5 inches diagonal size and Full HD resolution (1920x1080 pixels) with HD-SDI input capability in order to:

- Guaranty the video quality whatever the conditions;
- Keep an user friendly interface to adjust the contrast (contrast ratio 1500 :1) and brightness (1000cd/m²).

The two displays will be integrated in a « rack » or « support block » in order to secure the mounting system.



Figure 9 : output display

N.B. characteristics of the restitution display: L (15.2cm),H (8.6cm), Ep (2.8cm), Weight (267g).

2. Required compliance matrix

Wording	Compliance (C, PC, NC, NA)	Comments
Main requirements		
- Having, at day time (including bad visibility conditions) and at early night time, a clear vision of the road and the surroundings	C	Tests conducted / Field Evaluation
- Be able to drive from 30 to 80-90km/h	C	Tests conducted / Field Evaluation In order to drive faster than 60km/h, it is essential to have : - a vanishing point as far as possible; - a large field in order to ensure the security of the vehicle.

Wording	Compliance (C, PC, NC, NA)	Comments
- Be able to drive with the hatch closed	C	Tests conducted / Field Evaluation
- Be able to drive downtown without being dazzled.	C	Tests conducted / Field Evaluation The cameras are equipped with an automatic management of the dynamic (in case of bright light sources, image saturation is local and not on the whole image).
- Be able to show the floor signage, an individual close to the vehicle, at day time (including bad visibility conditions) and at early night time.	C	Tests conducted / Field Evaluation
- Be able to visualize downtown traffic light, at day time (including bad visibility conditions) and at early night time.	C	Tests conducted / Field Evaluation A traffic light will a local white mark on the display. At day time and until early night time, as a result of the sensor sensitivity and the sensor resolution, we will be able to distinguish clearly the sign post and the position of the traffic lights (green, orange, red).
Main requirements		
- Fully automatic optronic block with very low latency	C	Tests conducted on 21/10/2019.
- Power supply of the optronic block, compatible with the on-board network	C	
- Restitution block with automatic dynamic management and minimum latency	C	Display accepting HD-SDI, video input with possibility to handle the contrast as well as the brightness.
- Alimentation of the restitution block	C	Power via the optronic block.
- The implementation (optronic block + restitution block) shall not impact the pilots action.	C	To be mutually agreed
- The implementation of the overall operation (optronic block + screen) will be intuitive	C	The simultaneous video restitution on two displays (Function : On / Off). Button on the front panel of the restitution block to turn on/off the displays on night mode.
documentation / training / guarantee		

Wording	Compliance (C, PC, NC, NA)	Comments
No documentation	C	Within the framework, there will be no documentation provided.
12 months guarantee	C	.