JAT boresight station

Mobile station for boresight multi-sensor E-O systems

Fig. 1.Photo of the JAT200 boresight station

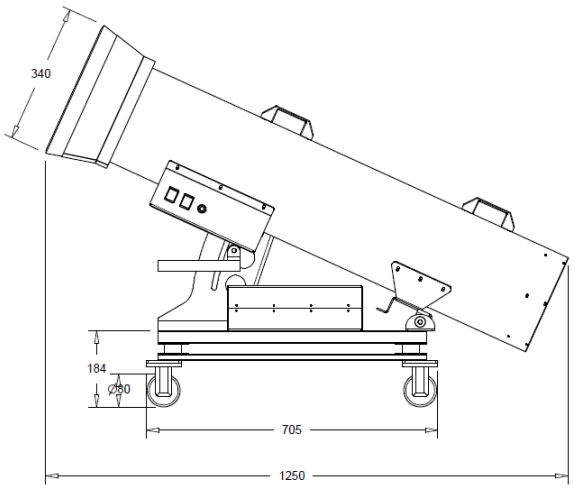

Fig. 2. 2D drawing of JAT200 boresight station

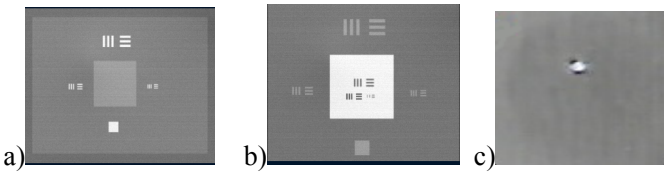

Fig. 3. a)Image of IR target generated by thermal imager, b) Image of VIS target generated by CCD camera, c) Image of laser target irradiated by LRF and seen by a thermal imager

BASIC INFORMATION:

Boresight is a process to align optical axis of single system or a series of optical or electro-optical systems with a certain reference optical axis or mechanical axis. Proper boresight is particularly critical in case of multi-sensor electro-optical surveillance systems built from a series of systems like thermal imager, VIS/NIR camera, SWIR camera, laser range finder, laser pointer.

Test systems offered by Inframet for testing multi-sensor surveillance systems (MS series) can do not only expanded testing but also boresight of these surveillance systems. However, these quasi universal test systems are also costly. Cheaper JT stations offer accurate boresight and limited test capabilities.

Both MS systems and JT boresight stations are generally laboratory/depot class systems. Some of Inframet customers built special platforms that make possible transport of these systems and they carry out tests outside laboratory. However, such situation is an exception from the rule and making tests at field condition is not easy.

JAT stations can be considered as a special mobile boresight station optimized for testing multi-sensor EO systems at airport/airfields conditions.

The JAT stations are compact, lightweight stations designed to carry out boresight and basic test of airborne multi-sensor EO systems. The stations are extremely simple to operate. Next, the image projector/laser receiver block is located on a movable platform. Further on, the station can be optimized for multi-sensor EO systems of different sizes of sensors optics. All these features make JAT an optimal choice for maintenance of multi-sensor EO systems or performance checking before important missions.

JAT stations were originally designed to support boresight/basic tests of airborne systems. However, these stations can be also delivered in versions optimized to test land or naval multi-sensor surveillance systems.

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FEATURES:

- Mobile station for task of boresighting, and basic testing of multi-sensor surveillance systems (thermal imagers, TV cameras, SWIR imagers, laser range finders, laser pointers, optical sights)
- Design optimized for specific multi-sensor system (customer is expected to deliver detail drawings of tested system)

HOW IT WORKS

The principle of work of JAT station is based on use of an idea to design a systems that could:

1. Project an image that could be visible by all imaging sub-systems (thermal imager, TV camera. LLLTV camera, SWIR imager) of the tested multi-sensor system into direction of this system,
2. Generate an image of the spot irradiated by transmitter of LRF, laser designator or by laser pointer that could be visible by at least one of the imaging sensors or tested system

Resolution/sensitivity checks are done by visual analysis of images of resolution targets generated by imaging sensors (thermal imager. TV/LLLTV camera, SWIR camera).

Boresight errors can be subjectively analyzed to determined more accurately with help of optional laptop with boresight support software.

After careful analysis it was decided to offer at this tender a new JAT200 station built using a concept of single aperture boresight station (like NGBU station) but with several important changes:

HOW IS DESIGNED

- The station is built using a concept of a blackbody/light source integrated with three targets located at a focal plane of a parabolic mirror
- Collimator aperture varies from 130mm to 250 mm (typical is 200mm) depending on aperture of tested system,
- Trolley enables easy transport and regulation of height and angular position of the projector block,
- User can regulate temperature of IR target seen by tested thermal imager (three steps)
- User can regulate light intensity of visible target seen by tested TV/LLLTV camera (three steps)
- Station is to be equipped with three test targets: boresight target, IR resolution target and visible resolution target to enable not only boresight but also checking of resolution and focusing of thermal imager and TV/LLLTV/SWIR camera.

TEST CAPABILITIES

Measurement/checking of:

1. Boresight error for a thermal imager working in different FOVs,
2. Boresight error for TV/LLLTV camera working in different position of zoom objective,
3. Boresight error between optical axis of TV/LLLTV camera and a thermal imager,
4. Boresight error between TV/LLLTV camera and SWIR imager,
5. Boresight error between thermal imager and SWIR imager,
6. Boresight error between monopulse LRF and TV/LLLTV camera,
7. Boresight error between multipulse LRF and thermal imager,
8. Boresight error between multipulse LRF and TV camera (visible channel),
9. Boresight error between laser pointer and TV camera,
10. Focusing and resolution/sensitivity check of TV/LLLTV cameras (Yes/No tests),
11. Focusing and resolution check of thermal imagers (Yes/No tests),
12. Focusing and resolution/sensitivity checks of SWIR imagers (Yes/No tests).

VERSIONS

JAT stations are customized stations optimized for testing specific, well defined multi-sensor EO system. This means that small size, compact design and mobility has been achieved but universality of bigger JT stations was sacrificed. User is expected to deliver detail mechanical drawings of sensors optics needed to optimize location and size of input windows of JAT station. Next, detail information about expected performance of sensors of tested system is expected. Minimal diameter of a circle that overlaps optics of all sensors of tested system is a crucial information. Depending of this diameter JAT station can be offered in several versions: JT150, JT200 and

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JT250 when number means aperture of JAT optics. Specifications in next section refer to most typical JT200 version.

SPECIFICATIONS

Table 1. Technical specifications of JT200 boresight station

No	Parameter	Value
1	System optimization	Boresight and basic tests of multi sensor (thermal imager, TV/LLLTV/SWIR camera, LRF, laser pointer)
2	Modules	JT200 test station, Battery, TROL trolley, Packing box for JT200 test station, AC220V/DC power supply, Power cable
3	Regulation range of height of output optics of JT200 station	at least from 300mm to 700 mm
4	Overall aperture of station collimator	200mm with holes optimized for sensors apertures
5	Boresight simulation accuracy	50µrad
6	Resolution of station collimator	at least 150 lp/mrad
7	Projection aperture for testing thermal imager	at least 70 mm
8	Projection aperture for testing CCD camera	at least 60 mm
9	Receiving aperture for testing transmitter of LRF	at least 40 mm
10	IR target parameter	1. Shape: square 2. Angular size: 9 mrad 3. Type of resolution pattern: set of three 3-bar patterns of spatial frequency: 5 lp/mrad, 10 lp/mrad and 15 lp/mrad 4. Boresight pattern: square of 0.4 mrad size
11	Parameters of Visible target:	1. Shape: square 2. Angular size: 3 mrad 3. Type of resolution pattern: set of 3-bar patterns resolution patterns of spatial frequency from 10 lp/mrad to 30 lp/mrad (expanded range possible) 4. Target contrast: 30%
12	Parameters of laser target:	1. Shape: square 2. Angular size: 9 mrad 3. Ability to covert incoming laser radiation into thermal radiation 4. Ability to convert incoming laser radiation into visible radiation
13	JT 200 station dimensions (including trolley)	<=1250x 310x300
14	Mass test station	<=16 kg
15	Dimensions of trolley	<=720x500x350 mm
16	Mass of trolley	<=13 kg
17	Operating temperature	-25 ºC - +55 ºC
18	Storage temperature	-20 ºC - +71 ºC
19	Humidity	up to 96% (non condensing)

Version 1.2

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