In Hot Tips & Cold Shots.Fieldcraft.Thermal Detection, there are some pretty gloomy postings about IR detection. As an electrical utility thermographer, I might shed some light (pun intended) on the subject. To qualify this, I am using the latest (I think) commercially available FLIR product, and am a level II thermographer, (total formal IR training: 2 weeks-experience using IR equipment: about 5 years.) I believe I am at least familiar with IR. Granted, my life is not depending on avoiding IR detection, so I guess I can have my opinions pretty safely. These are my observations about IR imagers using civilian equipment and are.. "just my opinion". It's up to you and yours to check them out in your world.

This is WAY brief, believe it or not. Anyone interested can email for more. This is about THERMAL detection, not IR illuminating sources for "starlight" scopes.

IR is not Xray, Hollywood bedamned-it cannot detect a differential heat image through common solid materials, plastic film (black or otherwise) being an exception. However, a good imager system can see through holes in a masking material ("IR masking" camo net). And if you are inside a dumpster, bodyheating the bad guy's side, he can "see" the hot spot on the dumpster's outside. But if you are not leaning (heating) against that side, he can't "see you". Your body heat will not be detected behind most readily available unholed blinding materials if you are not differentially warming/cooling those materials or allowing your own IR to reflect off of something behind/over you. BUT, if the shielding materials are alien to the surroundings, the material itself will probably stand out. See below.

Glass will not allow your THERMAL image to transmit (pass) through; same as the dumpster scenario. The lenses of IR imagers are made of exotic nonglass materials because of this.

Every piece (cluster) of matter, including gasses, emits IR if it is above Absolute Zero (minus 459.69 degrees F). The warmer a body gets, the more IR it will emit. Eventually it will enter the visible spectrum as it gets "red hot".

The surface of a piece of matter is where IR is emitted. Altering an object's surface will alter the rate at which IR is emitted. Stoveblack is a classic example.

Materials physically different from each other will likely emit IR at different rates. BUT the differences may be very slight.

IR imaging (read DETECTION) depends upon two objects having one or more differences in Temperature,
Emissivity/Reflectivity, and Absorption of the compared objects. For this application, we can forget about Absorption, and
you should all understand Temperature. Now, E + R = 100%, thus the more emissive a surface is, the less reflective. If two
dissimilar objects are at the same temperature, a high E will "look" hotter to an IR imager than a low E, thus forming an
image. Objects with different Temperatures and the right E's could "look" the same, thus forming NO image. Two objects
with similar temperatures and similar emissivities will present an unclear, poorly defined image. Herein lies your IR strength.

Here are some Emissivity values for a few materials, all in percents, all plus/minus a point or two. These are for short
wavelength commercial imagers and may vary slightly for long wavelength/long range military/LE equipment. Military techies
should have similar emissivity tables for your equipment.

Human skin
: 97
Black vinyl electrical tape
: 97
Surface sprayed with Dr. Scholl's aerosol foot powder
: 96
Water
: 95
Rubber, black, hard
: 94
Glass, smooth
: 94
Plywood, raw lumber
: 90-95
Most painted surfaces (NON aluminum paint)
: 90-95
Aluminum based paints, depending on formula
: 30-50
Oxidized (blued, parkerized) steel
: around 90
Snow
: 82-85
"Most" organics (vegetation)
: around 80
Cloth, untreated

: around 80 (Cotton
was a plant too)
BDU fabric, treated
: ????????? I
would like to know.
Sand
: 76
Clay
: 40
Gravel
: 38
Aluminum, bare and "shiny" (read "spaceblanket")
: under 10

Note the materials that cluster around 95, 80, 40, and 10

Now, to apply IR-101: In all of the scenarios below, remember that your body (or ANYTHING above absolute zero) emits IR in ALL directions. If there is a reflective object behind or beside you, it will pick up your IR and reflect it like you were a light bulb. Whichever situation and methods you use, if you have the opportunity, have an ally check you out from a flank with your best IR detection equipment. Or get the flyboys to check you out with FLIR's namesake. Do this by day AND night, as the sun will do weird (but predictable) things to the differential temps.

The BEST way to protect yourself from IR detection is get behind/under what is already there, and DON'T change the temperature of it. Since you obviously have to see and perhaps reach out, do so through the smallest portal(s) you can handle. Those "man-sized" targets detectable at 1100 yards are just that - man-sized - not the size of your nose and right eye. Remember that glass reflects some IR (100 - 94 = 6%), and the sky (space) is cold (approaching Absolute Zero), so if your scope is reflecting not sun, but sky, it will look COLD. If you have on a scope sunshade that is hot, the internal IR of the sunshade will reflect out as HOT.

I believe the GI Woodland BDU's are treated with an IR emittance reducer. If so, the "cloth" E figure in the table will change and you have to adjust for the following discussion. Or obtain untreated camo fabric or defeat that treatment (starch, I believe). The IR reducing treatment makes sense for a situation where the woods is cooler than 98.6 F. I hope the Desert Daylight BDU's are NOT treated, but the nighttime anti-starlight smocks

probably should be. If your BDU's image "cold"
against hot sand, you are just as "seen". I trust the techies were aware of
this, and have specified correctly. But you need to
confirm by looking through your equipment at your buddy against some typical
backgrounds.

It has been reported that "fresh" BDU's do indeed have an IR treatment
that fatigues (pun) with laundering in "brightener"
detergents. As a hunter, I am aware of the UV problem with animals with
good night vision (is it an overabundance of rods, or
cones, in the eye?) and there are detergents available via sporting goods
stores that do not contain brighteners. If you need
to maintain that BDU treatment, you might try that. But again, look at your
buddies with your equipment.

Now, in sand or vegetation (E = 76-80): If you HAVE to have artificial
cover for situations where your clothing will
approximate the temperature of the surroundings, you want to expose matching
temperature "stuff" with a similar E (around
80). Cover as much of your skin (97) as possible with cloth (80) (remember
that I don't know the E for treated BDU's). But
also remember that sweaty cloth in a hot, dry background might look cold due
to evaporative cooling. If you are in a hot dry
situation, a tented, solid (not net), dry camo fabric applied as a screen
might do the trick for IR. (Remember, same T, similar
E). Visual is another problem. Keep the outlines irregular for both IR and
visual. Square stuff in a curvy world stands out, no
matter the technology. Fresh local vegetation in front of the screen will
help both.

Camo face paint is PROBABLY a high emitter, similar to regular paints
(90-95), and sweat (water-95) is for sure. You really
have to keep that face behind something. I don't know what a synthetic ski
mask would have for an E, but I bet it is below
97. A plain old cotton tee shirt mask would work, but remember the
wet/dry/cooling problem.

Black ANYTHING is a good emitter. Blackened steel barrels, synthetic
stocks, and painted surfaces (all E's in the 90's)
should be cloth wrapped for IR and visual both. Black SWAT uniforms
probably have a higher E than camo. You need to test.

Dry rubber boot soles (94) are nearly as hot as your face - sock 'em (80).

Old cut local vegetation will be drier, thus HOTTER due to lack of
evaporation.

The name of this game is to keep both the Emissivity and the Temperature of the screen and clothing the same as that of the surroundings and keep those portals small.

If you are on bare clay or gravel (38-40) and are worried about aerial observation, dig in. Cover yourself with almost anything sufficiently rigid and then cover it with at least a thin but full layer of the local "dirt". This will match the E's. Once the moisture of the new cover layer equals the moisture of the surface around you (evaporative cooling), you will be in decent shape IR wise. Remember that these low E materials have a high Reflectivity, so block your own IR from getting out from under the cover. If there is a chance your body heat will affect the top surface of the dirt cover, use insulating material between you and the bottom of the "roof" to keep it the same temp as the ground around you. Foam board or sleeping bags will do that. The most critical times of day for this hide would be as the sun changes, because rapid heating/cooling of a thin layer of dirt will show up compared to the slower heating/cooling of the intact soil masses. If you can set up in a shaded spot where this will not occur, you should be in decent shape. If there is no shade, make the cover layer thick to create a heat sink approaching that of the surroundings.

If there is no threat of aerial observation, and it is only a frontal threat, a "wall" of local dirt with small portals would be the best bet.

Any new foxhole will print either hot or cold depending on the season and surface temperature, even if the surrounding soil is bare. The deeper soil temp is probably closer to 55 F than the surface.

On snow (82-85), build a snow fort or tunnel in and make small portals. Try to dust loose snow to duplicate surface texture. Pray for new snow. If you wore an aluminized face shield behind that snow fort, it would reflect the "cold" off of the fort, and cover your hot face. This might be a shiny side application of the space blanket, and could be worth testing. Water (95) is your breath when it condenses. And it is warmer than the snow. Only thing I can think of to do here is breath through a ski mask and let it condense before it fogs up over your screen.

As to "space blanket" applications: there might be some, BUT. If you are using the shiny side toward you to keep your IR from getting out, remember that the backside of it is probably not a good E

match to the surroundings and it will heat/cool a
lot differently than most natural things around you. If you are trying to
put the shiny side out angled down to reflect the IR of
the terrain right in front of you, there would be a 10% reduction in the
reflection, more if it casts a shadow. If the shiny side
is out and up, it will reflect the cold of outer space (or the heat of the
sun) - and it is going to look REALLY weird to visual and
starlight in EITHER case! I cannot think of a space blanket application
that I would stake MY life on.

In an urban situation, you will have lots of "normal" IR blockers to get
under/behind. Just remember that you are an IR
light bulb on the cold surfaces behind you. You cannot casually set up back
in the room shadows of a windowless building
anymore. Remember, glass will NOT pass through (transmit) your IR image.
BUT, glass (94) has a high emissivity and will
show its surface temperature rather well. If you are near the window
warming it with your breath, you will reveal yourself. If
you had a small barrel portal through an otherwise intact glass window, you
would be IR blocked, but visually seen. A loose
pane of glass back in the room shadows might be a possibility, especially
for a spotter. If the room is painted (90-95) and
warm (approaching 98.6 F), you might blend in IR wise. But if there is one
warm window/room in an "empty" building,
something is amiss. The painted walls behind you might not reflect your IR
really well, but a metallic light fixture might blink
every time you turn your face toward it. The best I can imagine is forget
about the "room" and get behind/under something
that should be there - sofas, chairs, drapes, etc. and keep your portal
small.

None of the above CONCEALMENT strategies are easy; none are guaranteed
to make you disappear to an imager. But they
will all help make you a less vivid IR image, thus less detectable. IR
imagers may or may not have an adjustment to key in
the emissivity for scanning and reading temperatures. I doubt military/LE
targeting devices would have that - you don't care
what the actual temp is, you just want to see a picture. Military/LE
devices probably have a temperature range adjustment to
scale up/down according to environment. They probably have an adjustment to
set the sensitivity - the difference in
perceived T to go from black to white (dark green to light green; whatever).
If this is finely tuned, it is like upping the
contrast on your monitor.

There is one comforting thing to consider: unless you are in the desert,

there are a lot of different "things" around you,
each of them with a slightly different Temperature and Emittance
combination. If you can make yourself "nearly" match the
most common IR surroundings and the sensitivity is set very high in order to
pick up your small T/E difference, the other guy
is seeing a lot more clutter around you, so your image will be just one spot
on the Dalmatian.

For the Ghillie fans: A man sized wad of only burlap and jute rope at
98.6 F plus or minus a few degrees will have the same
E all over it. But if there was some leafage from an IR blocking camo net
on one shoulder and a splotch of shredded BDU's at
the waist and some foreign force camo material shredded in there somewhere
in a cluster, all well supplemented with local
veggies, from an IR standpoint it would look like a pile of dissimilar
"stuff".

If you have gotten this far, perhaps a little DECEPTION is in order to
up your advantage.

Remember that "Sarge WILL find something during an inspection, so ya
might as well give him something so he will stop
looking." If you want to determine if indeed IR detectors are out there,
you might want to give them a cowboy hat to shoot
at. I don't know what the E of a bare GI plastic canteen is, but if you
either wrapped it with Scotch 33 electrical tape (97)
from a demo/como kit or sprayed it with foot powder (96) from your ruck, and
had 98 degree water (coffee? Body heat?) in it,
it would make a darned good human face (97) to a distant IR imager. Topped
with a BDU hat and moved about on a stick
behind some intentionally inadequate screening after dark (by somebody else
behind that cowboy's large rock), I suspect you
would soon know the targeting capabilities of the opposition - and also
acquire a muzzle flash. A piece of most anything
warmer than the terrain drug remotely through the grass at night should get
IR attention. Just don't pull it all the way to your
position. But you get the idea.

If you want to just give him/them something to worry about, scatter some
old tire shreds (94) around at points distant from
your position. They will look hotter than most surroundings when they are
actually the same temperature. Plus, they will
heat up more during sunlight, and hold their temperature for quite a while
into dusk. If you can make them move a bit, so
much the better. If they are behind intentionally poor screens, thus not
visually or starlight identifiable, so much the better.

This would be a great application for decoys specially made for the purpose - a visually camo'd, high E lollipop on a spindly, flexible stick.

One of the new IR illumination chemlights would do something, but I have no experience with them. I suspect one of them tripped off in front of or to the side of your position, yourself in a shadow from it, would blind any thermal imagers looking at you - like a trip flare would blind a starlight. Obviously this would be a defensive action.

There have been some pretty impressive demonstrations of the capabilities of IR equipment. And it is indeed impressive stuff, but it ain't magic. It can image warm footprints on a cold roof, or a "ghost" where you leaned against a cold wall and walked away. But those images fade pretty quickly - faster than the grass will spring back up on your trail to a nest.

I believe that if one person takes the time to study and understand the theory of IR systems and applies it to likely circumstances in his world and does it better than the other guy does, the first guy has an EXCELLENT chance of being the winner. That is true for sniping or bidding on a roof inspection. Even an unfavorable tilt in sophistication of equipment may be overcome with intelligent application of ingenuity. And it won't take a lot of formal training. After that, it is experience behind an imager. In your case, looking at your buddies in drill hides, and correcting each other's errors. I grant you that my "thermacam" is not a military targeting device, but if your life is professionally depending on IR avoidance, I hope you have access to IR theory training and support along with the opportunity to drill with your own imagers.

A rambling closure:

Overheard among the French crossbowmen at Crecy, 1346AD: "If we go against the Smoking Demons, we will die."

Letter from a Confederate camp, 1864: "The Yanks have put spectacles on rifles. There ain't no way to avoid a bullet from a mile away."

NOT to be uttered by my youngest son, USMC Security, Kings Bay NB, 2000: "If they've got IR, we are &^%#(+'d!"

If you may be exposed to a "new" technology, you just have to learn it

and apply it. Like you did for visual and starlight. In
fact, most of those old rules apply to IR: Irregular outlines.fresh
vegetation.local materials.etc. The only real new rule is
"Similar E - Similar T". Now, get with some equipment and TRAIN, DRILL,
EXAMINE, Train, Drill, Examine, train, drill, examine.....