

**UNITED STATES ARMY**



**BLACK HAWK UH-60**

► Project title:

"Mapping the Museum, Through Heat and Demographics".

Exploring the other uses of sensor technology, besides militarized uses.

-The goals of this project is to take the technologically advanced mapping systems that are inside this machine, the United States ARMY Black Hawk Helicopter, and place them into a museum, but in a way that would engage the viewer. The entire space would become a map, all four sides and ceiling. And as the viewer travels through the space, the map is constantly changing, making new targets, and letting them live the experience of traveling through this map in real live space.

***-BLACK HAWK-***  
***UH-60A,***  
***UH-60L,***  
***EH-60A,***  
***TM 1-1520-***  
***0013 UH-60Q,***  
***AND***  
***HH-60L***

The UH-60 Black Hawk is a four-bladed twin-engine, medium-lift utility helicopter manufactured by Sikorsky Aircraft. This design came around in 1972. The Army designated the prototype as the YUH-60A and selected the Black Hawk as the winner of the program in 1976, after a fly-off competition with the Boeing-Vertol YUH-61. The UH-60A entered service with the Army in 1979, to replace the UH-1 Iroquois as the Army's tactical transport helicopter.

**Mission:**

**Provide air assault, general support, aeromedical evacuation, command and control and special operations support to combat and stability and support operations.**





MH-60G: 'Pave Hawk' full-specification combat rescue/special operations aircraft for USAF, converted from existing aircraft; fitted with Bendix colour weather radar, Doppler navigation, GPS, INS, moving map display, new HF, VHF and satellite comms, IR jammer, threat-warning system, chaff/flare dispensers, FLIR, refuelling probe, IR strobes, ESSS, HUD, digital databus and additional guns; first MH-60Gs delivered to 55th SOS in December 1987 and all aircraft subject to a rolling modification programme to reach full capability

HH-60H: 'Rescue Hawk' combat rescue/special operations version for US Navy

HH-60J: Jayhawk, ordered by USCG as a replacement for HH-3F on SAR duties

UH-60J: replaced KV-107s in Japan Air Self-Defence Force service and S-61As of the Japan Maritime Self-Defence Force; essentially a Sikorsky S-70A-12 (UH-60L), they differ from US aircraft in being optimised for rescue missions; equipped with rescue winch to starboard, external fuel tanks, Japanese avionics and weather radar, turret-mounted FLIR; first aircraft built by Sikorsky, two more assembled by Mitsubishi which will build the remaining 26 on order entirely in Japan; operational from March 1992

MH-60K: Army special operations version similar to Air Force MH-60G but equipped to a higher standard from the outset; fitted with Texas Instruments FLIR, night vision imaging system, moving map display, OBOGS, T700-GE-701C engines, main rotor brake, and a comprehensive self-defence suite including missile plume detector, radar warning receiver, chaff and flare dispenser, IR jammer, radio jammer and laser warning receiver; prototype flew on 10 August 1990 and the first of 22 currently funded aircraft was delivered in spring 1992; 38 further MH-60Ks are required for Army and ANG units

UH-60L: improvements to UH-60As saw the basic weight of the aircraft increased by 25%; to remedy this situation Sikorsky developed the T700-210C-powered UH-60L which became the standard production transport version for the US Army from October 1989; 190 aircraft ordered, with modifications being retrofitted to UH-60As

MH-60L: UH-60Ls temporarily modified for special operations duties with US Army; replaced stop-gap MH-60As, and referred to as 'Velcro Hawks'; transferred to Reserve units after their replacement by MH-60Ks

VH-60N: 'Presidential Hawk' VIP transports delivered to HMX-1 at MCAS Quantico, originally as VH-60A; fitted with weather radar, extra sound-proofing and VIP cabin, shrouded exhausts, and extensive avionics and communications improvements

UH-60P: 100 UH-60Ls ordered by the Republic of Korea Army, with improved gearbox and main rotor brake; first Sikorsky-built aircraft handed over on 10 December 1990; the next 19 assembled from CKDs, with a further 80 to be built by Korean Air

UH-60Q: 'Dustoff Hawk', Medevac version utilising UH-60L airframe, with purpose-designed medical interior

S-70A: bulk of export Black Hawks delivered using civilian designation with numerical suffix allocated to each customer; deliveries made to Saudi Arabia, Philippines, Thailand, Australia, Jordan, Japan, Brunei, Turkey, Korea, Egypt, Mexico, Hong Kong, Morocco, and Rolls-Royce/Westland in the UK; Royal Saudi land forces received 21 S-70A-1 Desert Hawks and a further eight S-70A-L1 Medevac versions, all optimised for desert operations; 39 S-70A-9s were delivered to the Royal Australian Air Force, with a further 38 assembled by Hawker de Havilland in Bankstown, NSW

S-70B-6: ASW version for Greece, to be delivered commencing in 1995

S-70C: designation allocated to civilian versions of Black Hawk; applied to VIP-configured Brunei aircraft and also to Black Hawks and Seahawks for Republic of China, to circumvent restrictions on 'military' exports

S-70C(M)-1: Thunder-hawk, essentially SH-60F standard aircraft delivered to Republic of China navy from 1993 onwards

WS-70: S-70/UH-60 built under licence by Westland Helicopters in UK; offered in anticipation of RAF requirement to replace Wessex and Puma transport helicopters

YUH-60A: three prototypes entered for UTTAS competition with a further three built after Sikorsky had won; extensively modified during test flights resulting in new tail shape, upper fuselage fairing, cabin windows, and rotor shaft

UH-60A: initial production version of Black Hawk assault transport for US Army; manually folding tail boom for C-130 transport; steadily improved over the years through the addition of a rescue hoist, ESSS provision from the 431st production aircraft (retrofitted), M60D machine-guns replaced by M134 Miniguns, infra-red suppresses fitted to exhausts, wire strike protection above cockpit, accident data recorder, Tracor AN/ARN-148 Omega navigation system, satellite communications transceiver and GPS also added; in use with US Customs service as UH-60A 'Pot Hawk' for anti-drug surveillance; delivered to Bahrain Amiri Air Arm, Fuerza Aerea Colombiana, Philippine air force and Royal Saudi land forces; 'Credible Hawk' UH-60As delivered to USAF in mid-1980s as initial combat rescue version to replace HH-3s with ARRS; detail differences from Army Black Hawks include much of the equipment later added to Army UH-60As; 11 'Credible Hawks' ordered initially, and subsequent procurement and upgrade programmed repeatedly cut back

GUH-60A: non-flyable instructional airframes

JUH-60A: aircraft temporarily detached for test purposes

EH-60A: as part of the US Army's Special Electronics Mission Aircraft programmed, TRW equipped a single

YEH-60A with Quick Fix IIB emitter location gear and associated antennas; funding allocated for 40 aircraft, later designated EH-60C

HH-60A: single development aircraft for USAF HH-60D

MH-60A: 30 UH-60As modified for special operations use pending the delivery of the dedicated MH-60A; nicknamed 'Velcro Hawk' due to the haphazard addition of equipment; now withdrawn from all active-duty units, bar the Oklahoma Air National Guard, and replaced by MH-60L

VH-60A: initial designation for nine USMC VIP aircraft, later allocated VH-60N designation

UH-60B: Sikorsky designation for an improved Army transport version of the Black Hawk with a CRT cockpit, improved engines and other new features; most of these elements were included in the UH-60L

YEH-60B: UH-60A modified for a proposed Stand-Off Target Acquisition System with an underslung rotating sensor in a canoe fairing; first flown on 6 February 1981, but proposed acquisition of 78 aircraft abandoned to provide funding for J-STARs

**YSH-60B**: five Seahawk prototypes for US Navy to fulfill LAMPS Mk III requirement

**SH-60B**: production ASW Seahawk for US Navy; fitted with RAST probe, 25-tube sonobuoy launcher, towed MAD bird on stub wing to port, AN/APS-142 radar, ALO-142 ESM system under nose, single-piece pilot's windscreen, folding tailboom, primary armament two Mk 46 torpedoes; aircraft subject to phased upgrade programme involving addition of new weapons capability and avionics

EH-60C: production Quick Fix II-equipped aircraft designed to locate and jam enemy radio transmissions; fitted with antenna array on tailboom and folding whip aerial under fuselage; plans to acquire 130 EH-60Cs later cut to 66

CH-60E: proposed Marine Corps troop-carrying version, not proceeded with as Corps squad size too great for cabin

HH-60D: 'Night Hawk' combat rescue version for USAF, fitted with NVG-compatible cockpit, refuelling probe, ESSS provision, IR jammer, HIRSS exhaust suppressor, rotor de-icing, colour weather radar; subsequently fell victim to procurement cuts and only one development aircraft completed, later used in HH-60A development

HH-60E: proposed reduced specification HH-60D for USAF; not proceeded with in favour of HH-60A

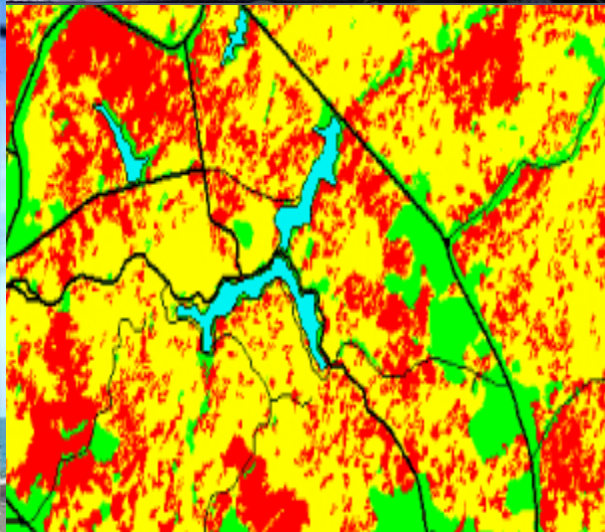
HH-60G: initially designated MH-60G, HH-60G aircraft at first not fitted with full MH-60G special operations equipment but optimised for SAR instead; subject to upgrade when funds allow

SH-60F: dubbed 'Ocean Hawk', the SH-60F provides inner ASW-screening for US carrier battle groups; less heavily equipped than SH-60B

# BLACK HAWK TECHNOLOGY

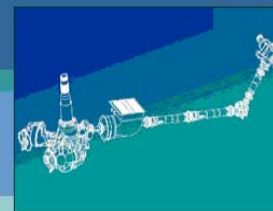
- ▶ **multiple driveshafts** (Driveshaft, multiple driveshafts are connected thru different connections, but are not all bolted into one point, instead they are bolted cockeyed to a metal "plate like object" of circular discs, as you fly the whole aircraft flexes, it gives it give, and allows there to be no metal rubbing on each other)
- ▶ **Missile warning system**
- ▶ **Mapping systems**
- ▶ **Cockpit**
- ▶ **Heat sensors**
- ▶ **Multi-functional display, 4 monitors, moving maps, as flying map changes with demographics, elevation, altitude, density, airspeed etc.**
- ▶ **Counter measures are on most devices** (In the Blackhawk these features include an immensely strong yet flexible and crashworthy cabin box, wheeled landing gear able to absorb very heavy vertical impacts, extensive armour plating around the cockpit and dynamic components, self-sealing fuel tanks, widely-separated and redundant electronic and hydraulic systems, and main rotor blades that can withstand hits by explosive or incendiary projectiles up to 23mm in size. )
- ▶ **Counter missile warning system, this allows for the helicopter to retrieve information as it is moving, of any approaching vehicles and weaponry they may possess.**
- ▶ **When rockets are aimed at you, system gives warning shoots out flares.**
- ▶ **"Lightbulbs"- when threatened by enemies, missile firework type ammunition are shot at the intruder.**
- ▶ **Revolving rope, and launching devices, used to drop soldiers from cab to ground.**
- ▶ **Fries bar: mounts in the cabin on the ceiling, fast rope excursion and extraction system, Ropes comes out, then drops out the ropes, to avoid people dragging behind**
- ▶ **Volcano system: mounts in cabin doors, a wall with little holes, and it shoots out little golf ball salt, hot magnesium "land" mines,**





#### T700 Series Engines

With integration of the latest in T700 engine technology, the BLACK HAWK Helicopter continues to demonstrate new levels of reliability, maintainability, and fuel efficiency.



#### Ballistically tolerant drive system

The Main, Intermediate and Tail gearboxes that makes up the drive system, can sustain cruise flight for 30 minutes after the loss of all oil. All 6 sections of driveshaft can sustain flight after projectile damage up to 7.62mm.

# THIS IS A SCULPTURAL OBJECT

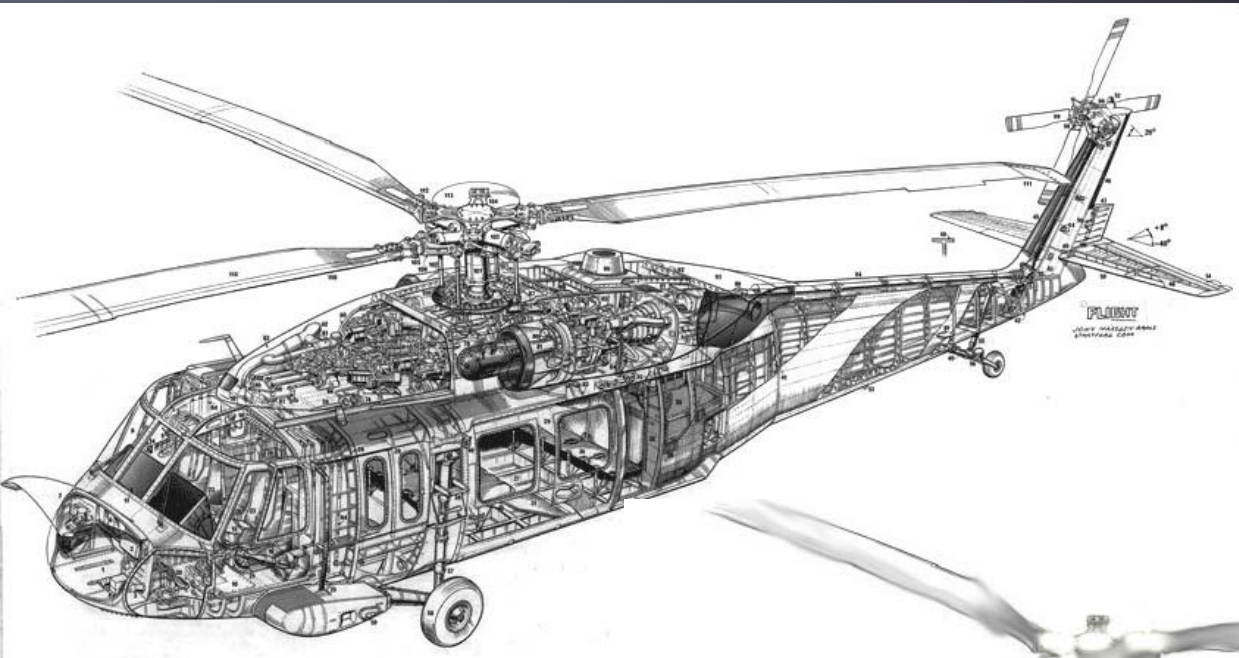


The maps and radar that are projected by the cab are similar to this one, some are more detailed for elevation, demographics, and others serve to search for people, so they use heat sensors as well as sensors that detect movement. These maps have the accessibility to see everything below them, and beyond seeing distance.

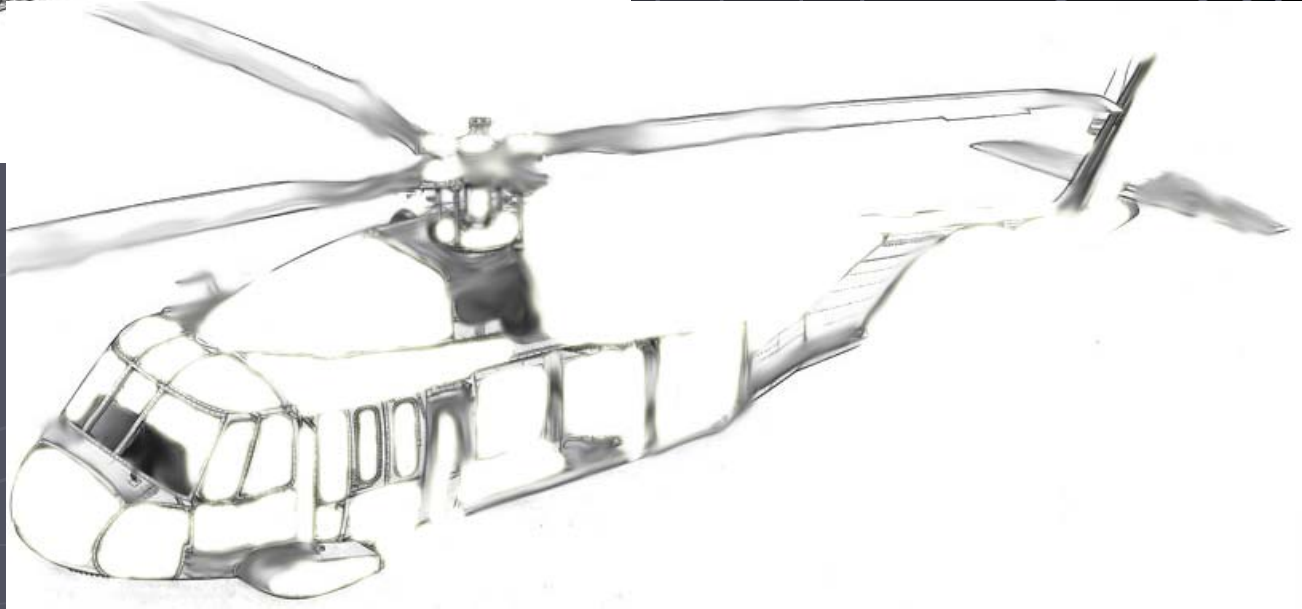




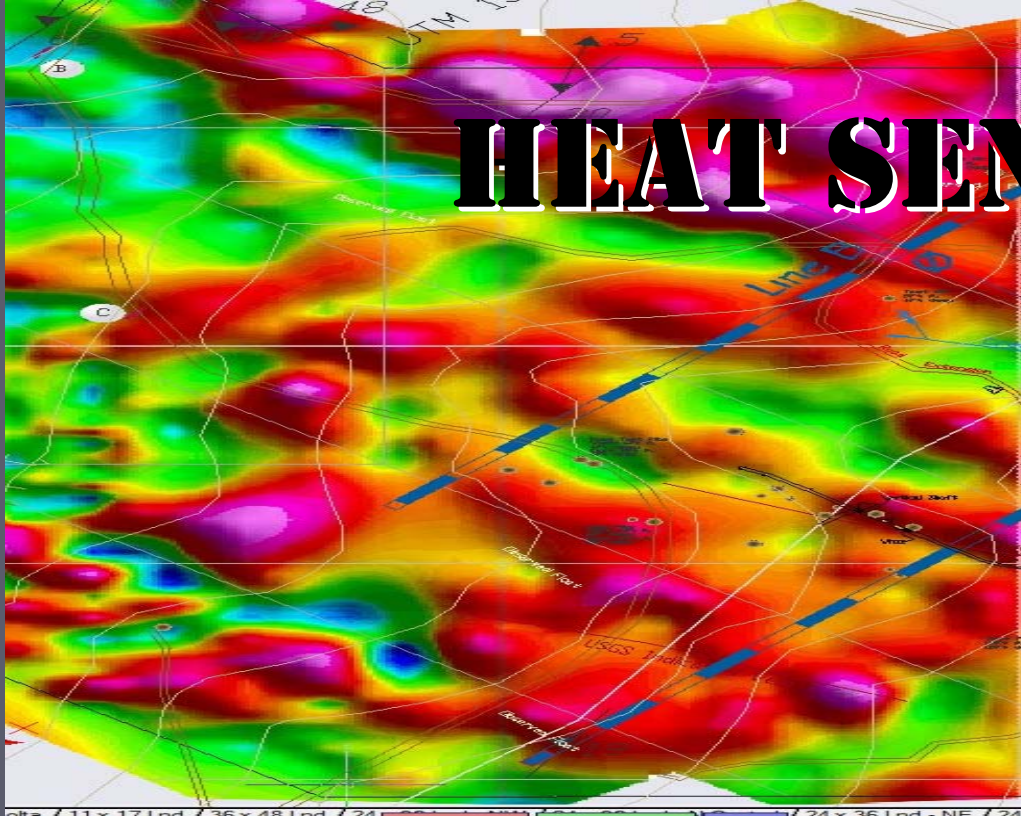
# FROM TECHNOLOGY TO BASICS:



The frame of the helicopter is an important basis for how the technology can be stored, and how it relays back the information to the receivers in the cab.



# HEAT SENSORS



Many of the mapping systems look similar to this one, and enable the soldiers to locate enemies, changes in demographics, weather patterns, etc.

Once enemies have been located, they shoot signals out to warn others.

# HOW DOES THERMAL VISION WORK?

- ▶ A special lens focuses the infrared light emitted by all of the objects in view.
- ▶ The focused light is scanned by a phased array of infrared-detector elements. The detector elements create a very detailed temperature pattern called a **thermogram**. It only takes about one-thirtieth of a second for the detector array to obtain the temperature information to make the thermogram. This information is obtained from several thousand points in the field of view of the detector array.
- ▶ The thermogram created by the detector elements is translated into electric impulses.
- ▶ The impulses are sent to a signal-processing unit, a circuit board with a dedicated chip that translates the information from the elements into data for the display.
- ▶ The signal-processing unit sends the information to the display, where it appears as various colors depending on the intensity of the infrared emission. The combination of all the impulses from all of the elements creates the image.

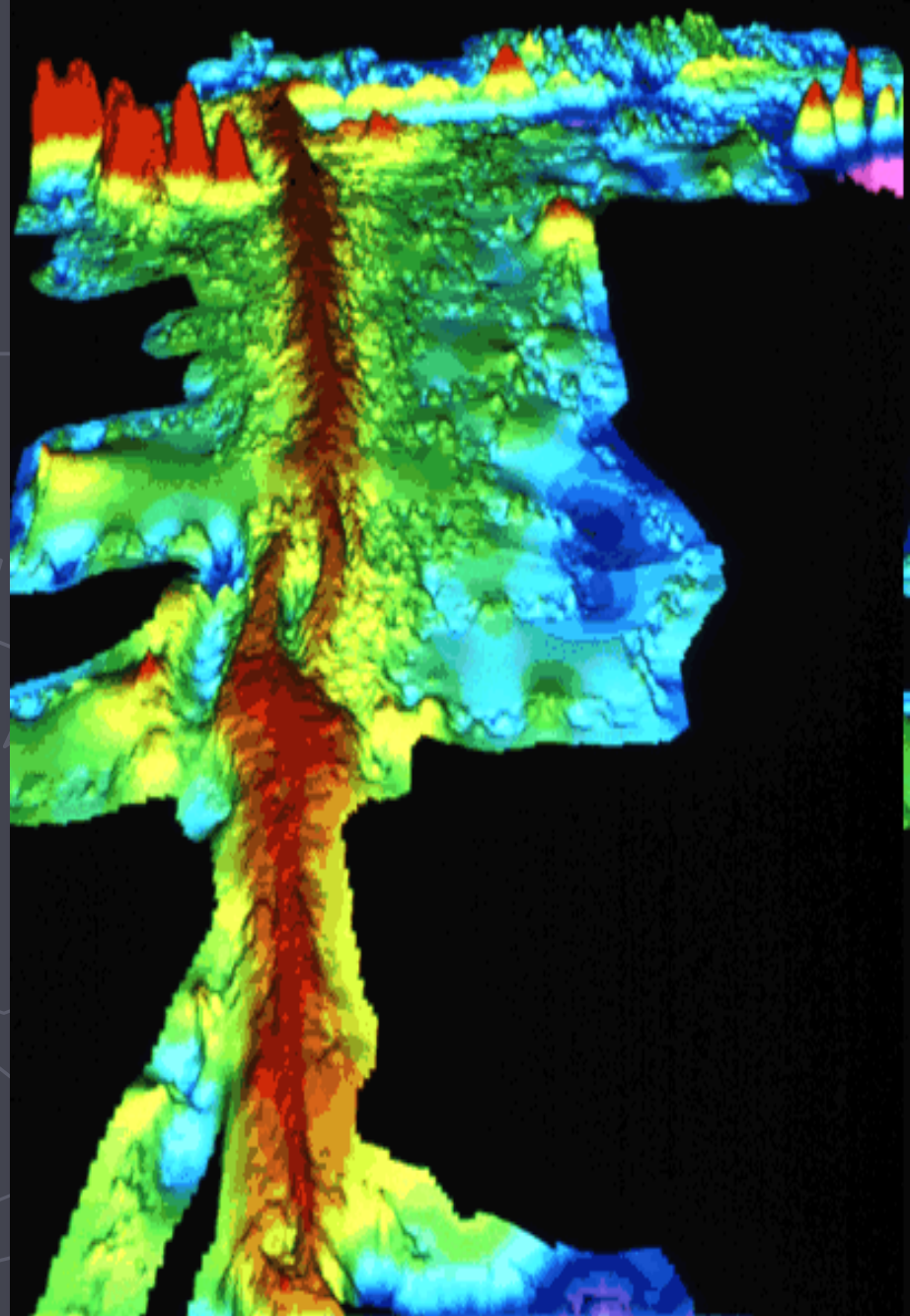


# IN ART

- ▶ -Little fireworks in the museum, it could be set up as a mapping agent to target audience members within a specific radius, and shoot out fireworks as a way to show intrusion. Since the floors and ceilings will be mapped, it will be triggered by foot placement.
- ▶ Since the sensor is something that causes enhanced vision, one can now see in this new way of demographic mapping and digital vision of the coordinates. For the viewer in the mapped out space, specific coordinates will correspond to reactions, and whether viewer reaches the goal or not will determine the "firework explosion".

# WEATHER PREDICTIONS

- ▶ Storm scope:
- ▶ Weather radar on the news see what weather patterns are coming in when they're traveling at high speeds.
- ▶ Infrared night vision and body heat sensors allow for easy targeting.
- ▶ Turned into changing the way the weather approaches the object.
- ▶ Perhaps its possible to turn this technology into a powerful tool of delegating weather patterns.

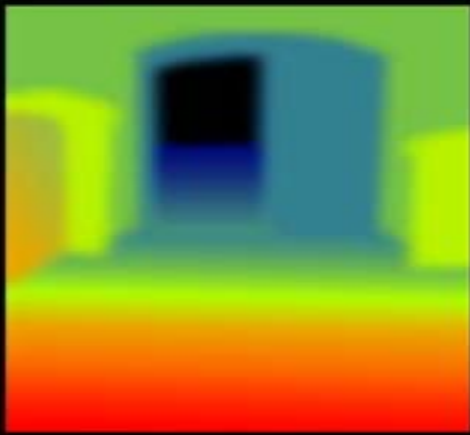




**IN ART**



# VISION ENHANCEMENT



# HOW WILL IT WORK IN THE MUSEUM?

- ▶ The proposal is that the museum would be essentially turned into a map, a huge digitally laid out map, and as the viewers travel through the space the map changes. It can take turns and wonder into new territories, wherever the projection chooses to take one. So each experience will be different. The key element is size, the map will overpower the viewer thus making them a small point on the map.



■ **QUESTIONS?**

■ **COMMENTS?**



# URLS

- ▶ [http://www.army-technology.com/projects/black\\_hawk/](http://www.army-technology.com/projects/black_hawk/)
- ▶ [http://webcache.googleusercontent.com/search?q=cache:mS7vI5ep-8AJ:en.wikipedia.org/wiki/Sikorsky\\_UH-60\\_Black\\_Hawk+black+hawk+helicopter&cd=6&hl=en&ct=clnk&gl=us](http://webcache.googleusercontent.com/search?q=cache:mS7vI5ep-8AJ:en.wikipedia.org/wiki/Sikorsky_UH-60_Black_Hawk+black+hawk+helicopter&cd=6&hl=en&ct=clnk&gl=us)
- ▶ [http://www.fas.org/programs/ssp/man/uswpns/air/rotary/s\\_h60.html](http://www.fas.org/programs/ssp/man/uswpns/air/rotary/s_h60.html)
- ▶ <http://www.sikorsky.com/Products/Helicopter+Tour>
- ▶ [http://www.aviastar.org/helicopters\\_eng/sik\\_s-70.php](http://www.aviastar.org/helicopters_eng/sik_s-70.php)
- ▶ <http://electronics.howstuffworks.com/gadgets/other-gadgets/nightvision2.htm>