M37/38 Environmental Battledress Uniform

The M37 BDU is currently the standard all-weather uniform of the Lorath Self-Defense Forces and the Occhestan Security Force. Designed to be light and comfortable enough to wear at all times it can also serve as body armor and an environmental suit in times of crisis. The M37 is certified as a class 1 Biological/Chemical and class 2 Nuclear protection systems. The M38 is functionally identical to the M37 with the exception of the hard armor, which are removed.

”Overall I would say this new suit of yours is excellent. My division loves the freedom these things give us (let me tell you, it is a pain having to change into those old space suits just to do some exterior maintenance) and you gotta love the added protection. We have come up with a list of tweaks we think would make it even better. One thing though, could you maybe do something with those thigh tubes? I know what there for and what a good job they do and how they are efficiently placed and all that, but ya know, there just weird. Other than that though, we look forward to when these things are standard issue. P.S. Ensign Kur’alys says you can’t have hers back after the field test is done.” -Lt. Mourren Occhesta, 2nd Watch Chief, Engineering Department, LSF Narsek to the COSI team handling field testing of the M37.

History

The latest in the M3X series of multi-purpose suits, M37 was developed to provide superior comfort and wearability for extended periods without sacrificing the series protection. Since its release several years ago it has totally replaced the M36 model as the standard issue uniform and been received very well by soldiers in the field. The M3X series was developed as the OCG and thus OSF began its exploration and colonization of the Lor system. Where the simple cloth uniforms of the other branches of the Lorath Central government military had long been perfectly acceptable for use on and below the ground it quickly became apparent that they would not be adequate in the harsh and unforgiving environment of space. The solution to this was a uniform that could double as a limited-use Spacesuit, M31. This design when through several revision as the Lorath became more familiar with space after their millennia long banishment below the surface of the planet. In the M34 model a degree of armor protection was added and evolved into the protection offered by the M37/38.

Used by: LSDF, OSF Type: Full NBC environmental hybrid suit Nomenclature: M37/38 BDU Designer: Cabinet of Science & Technology, OCG. Manufacturer: Cabinet of Industry, OCG Date of Initial Acquisition: 97 PR

Appearance

The M37 looks like a tight fitting body glove that covers the covering the wearer from neck to foot, including the wings. When worn, the collapsible helmet looks like a small, clear globe (excepting a small patch on the back of the helmet near the base). The rigid helmet has a teardrop shape (with the point towards the back of the head) and a clear from to provide maximum visibility. The suit does not come standard with any accessories, though several are available. Small bulges can be found on the back, belly, and thighs on close inspection. The chest area has two large pockets as do the thighs and several attachment points (loops and other fasteners) are placed on the uniform. Molecular adhesive panels[1)] are placed on either side of the chest and the shoulders for squad and ship insignia. Active dyes are used in the material of the uniform that allow it alter the color and pattern of the uniform to match its surroundings. The default color scheme of the uniform is a pixelated blue and gray pattern.

Lifespan: The M37 has a safe functional lifespan of 12 years should it be properly maintained and provided with resources to repair itself.

Components

Inner Suit

The inner suit is manufactured primarily from a composite of very high strength electro-reactive polymers and Titanium Disulfide fullerene (TiS2) weave. Other layers include a superconductive ceramic mesh, a very thermally conductive alloy weave, a gel layer, and then a TiS2/polymer layer (note that this layer is electrically inert). The inner suite is arranged in layers as follows:

- TiS2 outer: This is the outermost layer of the suit is composed of an electrically and chemically inert TiS2 and polymer layer. The polymer is “alloyed” in with the TiS2 to maintain flexibility of system since the TiS2 is by itself very rigid. This layer is of the tightest weave as it must protect the following layers from impacts and cuts. This layer also contains the active pigments and simple photoreceptors used by the chameleon system. This layer also serves as the primary protection against nanomechanical intrusion, as it is too densely packed for them to pass through (even extremely small ones) and the molecular bonds are too strong for such machines to disassemble.
- Superconductive ceramic mesh: This layer electrically isolates the following layers from outside electrical and magnetic interference. It can block all but the most powerful electromagnetic pulses.
- Antirad Gel: The next layer is a layer of naoscopic gel-filled cells which protects the occupant from sudden jolts and serves as the systems primary high-energy radiation blocker (beyond its normal properties it is also doped with several isotopes to improve its absorption. The gel primarily absorbs photonic radiation, while the polymer and ceramic weaves capture particle radiation.
- Thermally conductive alloy: This layer consists of a proprietary metal-ceramic alloy. It serves to assist in radiating heat produced by the suit and wearer and prevents external radiation (whether from stellar bodies or directed energy weapons) from penetrating deeper into the suit. This compound is not restricted to its own layer and continues throughout the suit (especially to the outer layer of the suit) to ensure proper heat transfer. Both the TiS2 and ceramic mesh are also quite thermally conductive and further protect the suit.
- The next layer is composed of a composite mesh of electro-reactive myomer fibers and TiS2 threads. The polymer myomers are arranged within the mesh in such a way that they can act as both splint and muscle. As a musculature it is not very strong, acting a minor aid (primarily to negate the weight of the suit). It cannot provide anywhere near the boost of powered hard armors. Because it is advised that a attachable exoskeleton be used when enhanced strength is necessary.
- Next is a layer of nonconductive ceramic mesh. This layer isolates the myomer weave and the gel so that either can be activated without affecting the other.
- The next layer is a network of nanoscopic magnetorheological fluid filled cells. This layer is designed as an energy absorber, particularly kinetic impacts. Beyond the elastic nature of the fluid it is capable of changing to a more solid crystal structure to blunt an impact. This change can be accomplished in under 300 nanoseconds which is sufficient for the system to achieve sufficient rigidity to stop most projectile small arms (though not the higher powered rifle rounds, such as the M7).

- MIRS distribution network: All layers below the superconductive mesh layer posses an interconnecting network of capillaries that move the MIRS fluid around the suit, aiding in repairs and sealing of breaches. The system cannot perform complete repairs on the suit as it cannot reconnect severed TiS2 threads (it can only reweave them and apply adhesives to keep it together), though it can fix most of the others layers of the suit. Because of this the suit is not whole self sufficient and after combat it will need to be repaired by macro-scale nanomanipulators (which can fix the severed TiS2 strands).

All of the layers (excepting the gel layer) are repeated several times. The wing leading edge has extra hard armor to act as structural reinforcing for the vulnerable area. Smaller structural members extend along the wing to provide additional support.

NOTE: It is not possible to use the wings for flight when wearing a M37/38 suit.

Hard-armor Panels

The hard-armor panels consist of an atibium[2)] ceramic metalloid. While the armor is fairly atibium low (to keep weight to a reasonable level) it still serves as a very effective armor against both directed energy and projectile weapons, capable of stopping all but the most powerful small arms weaponry (excluding those designed for anti-armor application). The panels are nested in between the layers of the armor just below the first TiS2 weave first.

Overall Protection

Projectile: The weave and armored panels combined can stop small arms, excepting high velocity, high energy weaponry such as the M12 SARL and M22 GAR. Lower powered rounds (such as those from pistols and SMGs) can be stopped completely, though the dispersed kinetic energy may still cause damage.

Slashing & Piercing Weaponry: The tight, interconnected weave of the TiS2 layers provides effective immunity to the cutting and piercing damage from bladed weaponry. These weapons may still cause damage do to blunt trauma.

Blunt Trauma: Though the layers of the armor do provide a fair amount of protection (mainly through dispersing it over the whole suit) the suit provides the poorest protection in the area of blunt force trauma. The armor can mitigate small-area impacts (punches, kicks, blunt melee weaponry) to a degree by spreading out the damage, but it provides only minimal protection against wide-area blunt trauma (such as falling). Barring massive impacts blunt trauma is generally restricted to soft tissue damage (bruising, internal bleeding, etc.) as the spreading effect of the suit generally prevents enough force being applied at any one point to break bones.

Energy Weaponry: The layers of the suit all combine to provide protection against the increasingly prevalent energy weaponry. It provides extremely good protection versus low-speed particle radiation (alpha & beta radiation, slow-neutrons). However, against highly penetrative radiation it only provides moderate protection as it is neither thick nor dense enough to fully stop a heavy gamma or fast neutron exposure. In a relative sense however, it does provide better protection against photonic radiation (x-rays, gamma rays) than it does high energy particle radiation (very fast neutrons). Its protection is

sufficient to protect against interstellar radiation in most situations. The stable atomic structures of the suit's material prevent after-radiation from radiation exposure. It provides very good protection against thermal weapons as the outer layers are excellent insulators and can reflect or reradiate heat to the environment very rapidly.

Mobility is ensured by the segmentation of the panels in special configurations to essentially nullify interference of the armor with mobility (the most serious interference is in the chest area, though this is minimal). At the major joints (hip, knee, shoulder, and elbow) the armor flutes out slightly to provide protection without having to directly cover (and thus interfere with) the joints. Due to the high number of degrees of freedom possessed by the wrists and ankles mean that no serious amount of hard armor can be use there without causing a notable interference with movement. This is further enhanced by a spiral coil around the wrist (somewhat akin to an accordion) that reduces interference to well below acceptable levels. The back has a large bulge at the base of the back and secondary bulges on the thighs and upper back.

The M37 can be equipped with two helmet types. The first is a clear collapsible design kept at all times in a resalable pouch on the armor for use in emergencies. The other is a teardrop shape with the pointed rear and wide clear front to provide no hindrance in peripheral vision. An organic LED (OLED) layer covers the inner surface of both helmet types. This OLED can display any information stored in the suits computer core or gathered from its sensors at the wearer's request.

The collapsible helmet is made of an electroreactive high-strength polymer. It has a modicum of impact resistance and radiation protection, but for any situation in which combat is expected it is advised to use the rigid helmet. The rigid helmet is made of a layered composite similar to the rest of the suit, with the exception of a hard armor layer covering the outside (of similar composition to the armor panels of the suit). The tapered rear of the helmet contains omni-directional sensors and a sub processor for the sensor suit of the suit to prevent any lag time between the main core and the wearer's requests. High resolution IR, visible, UV cameras, and millimeter wave radar exist on both sides of the helmet to provide for holographic recordings. Both helmets seal with the suit by a multilayer molecular bond tight enough to maintain the integrity of the suit in all rated environments. The rigid helmets are kept in emergency lockers in all compartments of LSDF/OSF vessels and bases.

Both of the wrists also contain OCED panels to call up data if the helmet is not being used. They also contain flexible very high-efficiency LED lamps.

The feet and hands have molecular adhesion pads that allow the suit to grip on nearly any surface. Earlier models in the M3X series used magnetic pads, but these were dropped on the M36 in favor of the molecular adhesion pads for reasons of versatility, despite the increase in unit cost. The feet units, together, can support up to 250kg in a 1G environment.

Interior

The interior of the suit consists of a smooth, dense rubbery polymer. This polymer has fine grooves going along its internal side (the side pressing against the wearer's skin) that improve comfort and make it easier for the suit to maintain a proper climate within the suit. Through these grooves a thin layer of MIRS fluid passes over the wearer's body, removing waste (such as oils and dead skin) as well as

maintaining a proper temperature. The MIRS system's primary components exist within the bulge on the wearer's abdomen, stretching up either side to just below the armpits. The system receives power from a array of high-capacity solid-state, flexible batteries found on the back of the suit augmented by a thermocouple system that uses the user's excess body heat as power. A small nanomechanical computer provides the data storage and processing power needed by the suit (which is quite minimal) and is located at the base of the back in a well padded, well shielded pouch. A phased-array -type antenna covers most of the wearer's upper body, allowing the computer and the wearer to receive and transmit data on a wide range of EM frequencies. A short range subspace transceiver (which can also be used as an emergency beacon) rounds out the suits communication system.

MicromachIne Repair System (MIRS)

The M37 incorporates a MIRS system similar in function to the 'hemosynth' system used by the YSE, although the choice was made to use more capable and resilient micromachines over the nano-and-smaller units of the hemosynth system. This system is capable of making minor repairs (sealing punctures and the like) to the suit, maintaining a stable environment for the wearer (so long as power lasts), and several other functions. If the user does not possess sufficient cybernetic alterations to link with the suit computer it will maintain the standard functions of the MIRS system. Barring direct instructions from the wearer, one of the first things the MIRS control system does is to direct micromachines and enzymatic products to the digestive track. Here the system causes a total break-down of all food-stuffs and induces the cilia along the intestines to absorb it. The blood flow through this area is also stimulated to a higher level to increase the amount of material that can be absorbed.

The system interfaces with the wearer through two intravenous lines that go directly into the femoral artery and vein in the groin/hip region. This allows the MIRS system to recycle the wearer's blood very fast. This is one of the primary functions of the system, as it allows it to process waste directly from the wearer's body in a much more efficient manner. The waste is then broken down, with all usable components (barring catalyst reactions, the suits MIRS system is capable of breaking down most molecules but some are not due to energy efficiency issues) being stored in pouches in the suits abdomen and along the sides of the chest for later use in creating nutrients or minerals. Those things that either cannot be broken down or are of no use are shuttled into two small pouches at the base of the thigh. These pouches contain quite a number of internal membranes to separate potentially reactive wastes from each other. When full, they can be detached from the suit and emptied (either water or air can be forced through the bottom end to expel the waste). Note that the waste products of the suit generally do not smell and are actually quite sanitary, as any bacteria that were used in there processing where removed before the waste entered the pouch and the processing would have killed any hostile bacteria before it entered the waste pouch nor are gases like methane present, as these are retained for their chemical components.

It also allows for oxygen to be directly infused into the blood and for CO2 to be removed for catalyst processing back into oxygen (the carbon is formed into a graphite flakes, which are stored in special compartments in the abdomen of the suit). The development of this in the M3X series of BDU was one of the key developments that lead to their large-scale adaptation. With this ability, along with the nutrients and oxygen (stored in a dense, solid-state bonded within a organic molecule; it is stored in pouches along the outer side of each thigh), the suit can keep its wearer alive for weeks off the standard compounds stored in the suit at all times.

The suits stores of material can be replenished rapidly with the use of preprocessed infusions (via openings that can be created in the suit) or through it slowly regenerating them by removing them from the wearers blood stream (though it would cease doing this immediately if it brought the blood concentrations of these things below safe levels, or upon order of the wearer or a medical professional)

Notes

- The M37/38 does not have any provision for attaching conventional pins (i.e. ones with a actual pin) as the pin would not be to penetrate the outer surface of the uniform.
- Winged flight is not possible when wearing the M37/38 suit as the suit completely covers the flight surfaces.
- No major shape changing is possible when wearing the M37/38 as the suit will not stretch far enough for the changes and any protrusions will not be able to penetrate the suits layers (since it has no extra openings).

[1)]
Molecular Adhesion Panels (MEP): Using design similar to the gecko, MEP systems use a network of polymer strands that branch to a atomic level. This allows the panels to utilize the Van Der Walls interactions that occurs between all atoms to adhere to nearly any surface. The same system is used for rank and unit patches, although those particular panels do not contain the high density that the foot & hand ones do and have nowhere near the attachment strength (though a normal Lorath or human could not remove something attached to them without extreme effort if the system had not been previously disengaged).

[2)]
Atibium: Atomic mass 132 in the period table, atibium is located in the transuranic stability band. It is extremely stable, with a half-life in excess of 7 billion years. Its thick, complex electron structure allows it form numerous covalent bonds with other materials similar to carbon. An artificially created (and therefore fairly expensive to produce) element it sees frequent usage in armor and military alloys and ceramics as it can greatly strength a alloy. Its mass also makes it a extremely good absorber of radiation, particularly when used in large quantities.