

**BACKGROUND
INTELLIGENCE**

**OPERATION
COPERNICUS**

WAR!

Galaxy City, Terra, June 4-At 2130 SMT today, UP President Giorgi Spelnikov officially declared war with Andromeda.

The declaration came only eleven hours after confirmation of Andromedan warships entering UP territory, apparently in an attempt to take over the mineral-rich Trojan asteroid group near Jupiter. The incursion resulted in over 200 deaths and the destruction of at least six UP ships within minutes after the Andromedan fleet was first detected by a remote outpost.

Spelnikov spent the eleven hours in hologram conference with galactic chiefs, top cabinet advisers, congressional leaders and planetary governors, said aides.

"Everything has been tried to avoid this conflict," said Diamond Hall press secretary Pierre Caulfield, speaking after the announcement. "The Andromedans won't negotiate a peaceful settlement."

Twenty-seven years of warship-supported expansion have not relieved Andromeda's shortage of natural resources. The metal-laden Trojan asteroids have become an increasingly attractive target for acquisition.

Last year an Andromedan delegation met UP officials with demands for access to the asteroids. Foreign exchange secretary Armand Astor reported at that time that the Andromedans had no desire for bade; they simply presented claims on half the mining outposts in the Trojan Group.

Talks indicated that even if Solaria had been willing to agree to such an arrangement, Andromedan satisfaction would likely be short-lived. "Andromeda has no wish to develop new outposts," Astor stated after discussions in September. "Their only interest is in fully equipped and operational asteroid factories, complete with supplies of ore and other raw materials. This interest does not include any desire by Andromeda to pay for anything they might acquire." The meeting produced no agreement.

At the time, Astor was accused of "inflammatory rhetoric" by pacifist critics. He generated controversy with off-the-cuff references to "banditry" and "robber-barons." Astor later apologized for making the remarks, but refused to retract them.

Further meetings with Astor and other high officials occurred in the following months, but the Andromedan delegation refused to accept any of the Solarian team's dozens of proposals. Never warm, relations with Andromeda cooled further.

Talks ceased in April, and rumors of trouble began soon after. Outsystem leaders have become frequent visitors to Galaxy City as they forge and confirm alliances with Solaria.

Now the Andromedans have indicated by four increasingly hostile actions during the past ten days that

they have chosen war to obtain their goals in the Trojan Group.

May 26. Andromedan commandos staged lightning raids on three of the richest mining centers in the Copernican Quadrant, escaping with over thirty tons of partially-enriched uranium.

May 31. Andromedan attack vessels destroyed a Solarian lifepod flying escort to Orionese state department personnel.

June 2. A UP exploration ship discovered massive stores of toxic micro-organisms in the Trojan Group, confirming earlier SIA reports that the Andromedans intend conducting biological warfare against Solaria.

Today, June 4. Invasion. At least one fleet of Andromedan warships has entered the Trojan Group, and has attacked Solarian vessels and installations.

Human Solidarity; Military & Industrial Build-up.

"Our desire for peace has not diminished. We shall continue to seek a negotiated settlement with the government of Andromeda," President Spelnikov concluded today. "But the chances for successful negotiations are not good. We must prepare to fight for our freedom...and for our lives."

The president stressed the solidarity of the human nations in this cause, citing the expressed support of the Aristotelian Guild, of the Orion Republic, and of the Centaurian Free State.

During his speech, President Spelnikov announced the regearing of industrial facilities for wartime production, with emphasis on the manufacture of warships and weaponry. As an interim measure, several hundred existing lifepod spaceships will be converted into "Katana" single-seat fighters.

"Our need for volunteers cannot be overemphasized," said Spelnikov, the strain of the last few days clearly apparent, his face haggard and his voice trembling slightly. "We can only hope that those citizens who are qualified to fly in space will rally in the name of humanity. Or humanity may cease to exist"

Social Technocrat leader Miklos Andropoulos voiced agreement with Spelnikov, ending his normal strident opposition to administration policies. "This is not a time for partisan politics," he told reporters. "Andromedan intentions have been made very, very clear. It is the duty of every Solarian to stand behind his government in this time of crisis. We must put aside our differences and face the enemy together. And let no one doubt he is an enemy."

DIPLOMATIC VESSEL ATTACKED; ESCORT DESTROYED

Capitol City, Nova Quadrant, Trojan Group, May 31--Several MUG-type spacefighters converged on the ambassadorial transport *PEACETALK* today. The unarmed transport, carrying Orionese Subsecretary of State Ma'Ret Hut'n and her entourage, escaped damage under the protection of an escort Katana fighter and quickly returned to Cape Canaveral.

The transport-turned-fighter wasn't so lucky. According to observers in *PEACETALK*, the crew of Escort Vessel *GAGARIN* acted with exemplary courage, valiantly diverting the attacking ships until the diplomatic craft was safely away, despite the obvious danger to their own lives.

Adm. Arthur MacDougall, recently appointed navy chief of staff, believes that the MUGs were seeking to kidnap the envoy ship. "They could have destroyed the unarmed ship if they wanted: the escort would have been powerless to prevent it. Instead, they went after the escort when he found them. The only

explanation is that they wanted the delegates' ship intact."

Defense department undersecretary Charles Newton disagreed: "It was clearly the intent of the attackers to destroy both ships. They turned their attention to the escort because it was firing on them. If they hadn't been delayed by the escort's defensive action, the delegates would have been killed as well."

Both MacDougall and Newton agreed that the pilot of the escort vessel, who is still unidentified pending notification of next of kin, should be remembered with the highest possible honors.

Government officials are being notably tight-lipped about possible Andromedan involvement in this incident. The MUG is the standard Andromedan close-range attack vessel. One reliable administration source states that the government is reluctant to claim hostile Andromedan action because the attackers may have been some of the "private individuals" to whom the Andromedan government has sold several hundred MUGs in recent years.

PEACETALK was enroute to a rendezvous with the starship *ARMSTRONG* at Freeport Base at the time of the attack. Officials say Subsecretary Hut'n and her now safely departed on the starship, bearing goodies of the alliance agreement with her government signed by President Spelnikov yesterday.

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OUTPOSTS RAIDED

VIRGINIA CITY, COPERNICUS QUADRANT, TROJAN GROUP, MAY 26-PHI, ADONIS AND SPARTA RESOURCE STATIONS LOST MORE THAN 30 TONS OF 5%-ENRICHED URANIUM IN COMMANDO-STYLE RAIDS TODAY. PHI WAS ATTACKED AT 1004 SMT, ADONIS AT 1214, AND SPARTA AT 1608. THE TIMING INDICATES THAT THE RAIDERS USED A SINGLE VERY FAST SHIP, BUT THERE IS SPECULATION THAT THE STOLEN CARGO MAY HAVE BEEN TRANSFERRED TO A LARGER VESSEL BETWEEN ATTACKS.

URANIUM IS OF COURSE ESSENTIAL TO THE FUELING OF SPACESHIPS, AS WELL AS FOR PLANET-SIDE ENERGY NEEDS. WHILE IT IS NOT COMMON IN THE ASTEROIDS, LARGE AMOUNTS ARE COLLECTED DURING THE PROCESSING OF OTHER METALS. THE PRESENCE OF URANIUM IS ONE MORE REASON THE ASTEROIDS BELT IS ESPECIALLY-VALUED SOLARIAN TERRITORY.

MINERS AT THE EIGHT OUTPOSTS STILL WORKING IN COPERNICUS QUADRANT ARE DEMANDING THAT PRESIDENT SPELNIKOV ACCORD NATIONAL-EMERGENCY STATUS TO THE RAIDS, THUS ALLOWING UP NAVY WARSHIPS TO PATROL THE REGION. THE OUTPOSTS THEMSELVES ARE UNARMED AND UNSHIELDED.

IN A DIFFERENT VEIN, EXPERTS WRYLY COMMENTED ON THE SIZE OF THE TAKE FROM THE THREE OUTPOSTS. "PICKUP SHIPS VERY RARELY LOAD ANYWHERE NEAR TEN TONS FROM ONE OUTPOST," SAID JUAN MARCOS, ASSOCIATE SECRETARY OF MINING AND MANUFACTURING. "OUTPUT HAS AVERAGED ABOUT FIVE TONS A WEEK FOR THE LAST THREE YEARS. AND, THE LAST PICKUPS WERE ONLY A DAY OR TWO BEFORE THE RAID. YOU CAN BE SURE WE'RE GOING TO INVESTIGATE TO LEARN WHY THESE THREE OUTPOSTS EACH HAD TEN TONS OF URANIUM ON HAND SO SOON AFTER THE PICKUP SHIP SUPPOSEDLY CLEANED THEM OUT. IT CAN HARDLY BE COINCIDENCE THAT EACH OUTPOST HAD RECORD AMOUNTS OF URANIUM JUST WHEN THE RAIDERS ARRIVED."

NONE OF THE SEVENTEEN OUTPOST PERSONNEL KNOWN TO HAVE WITNESSED THE RAID WERE AVAILABLE FOR COMMENT.

COMBAT NO PICNIC FOR PILOTS

Ovid Center, Copernicus Quadrant, June S-The first encounters between Andromedan forces and hastily **mobilized** Katana fighters have shown the enemy to be a tough opponent. Initial **results** were &rely favorable to **Solarian pilots, with** Andmmedan **losses** on/y a few ships higher than our own.

One of the most successful **Solarian** fliers was **Lt. Miguel** O'Brien, a/ready rated an ace with six Andmmedan **kills** confirmed. He spoke brief/y with reporters in the ready room of the impromptu **UPSF** attack center here, giving a somewhat different **picture** of the enemy than has been pronwlgated in official releases.

"You can forget that stuff about the Bugs **being** dumb," said **O'Brien**. "They may not think like we do, but they know how to f/y a warship. I mean, &ok, their **pilots** are genetically **tailored** for the job, then they're reflex-trained from the moment they pupate. So in a way, they're like superbly programmed computers. They can assess a battle situation and take the right action. If you **don't** do everything just right, they'll **kill** you very quickly. Who cares if they think about it or not?"

But what is the right thing to do? How did O'Brien not on/y survive, but destroy six enemy ships as well?

"The first time, I was lucky, " he admitted. "I fired and missed a few times trying to hit some Daggers from the side. That irritated the Bugs, I guess, because the next thing I knew, three of them were **coming** right at me. I was getting low on ammo, so I turned tail and ran at **full** acceleration, hoping I had enough engine to get away from them.

"It didn't work. They lined up behind me and matched my thrust. In no time they were taking potshots at me. They can shoot, too. My **shield** was taking a pounding from their lasers.

"**Well**, the only thing I **could** think of to do at that point was brake and hope they'd keep on going. Fortunately, it worked. I hit **full** retrothmsters, and before they caught on to what I was doing, they were past me, showing me those nice white unshielded tail sections. I got off three quick shots, and it was a// over.

"Anyway, I **tried** the same thing a little while later, and it worked again. Seems to be a pretty **effective** tactic. "

This **reporter** commented that O'Brien made fighting Andromedans sound pretty simple. O'Brien **quickly** set me straight.

"It isn't simple at all. Like I said, I was lucky, " he asserted, with surprising mildness. "Your timing has to be perfect, for one thing. Slow down too soon, and the enemy **will** just f/are out to the sides and knock the stuffing out of you. Wait too long, and he'll shoot you to pieces from the rear. For another thing, even if you get the braking maneuver right, you've **still** got to do some darn good shooting in just a few seconds." for a moment his youthful face looked o/d. "It would be very easy to mess up. "

As O'Brien finished speaking, an a/arm sounded in the ready room, announcing another scramble-an Andromedan attack group had been spotted entering the sector. In less than five seconds, the room was empty of pilots.

This time Lt. **Miguel** O'Brien wasn't so lucky. He scored two more **kills**, but he didn't wme back.

INDUSTRY PREPARES FOR WAR

New York, Terra, June 1—President Spelnikov's announcement of war yesterday has spurred heavy investment in war-related industry, which some analysts feel may encourage growth in an economy which has been sluggish through the last few months. Early reports indicate the analysts are right, with the Dow Jones-Yoshima industrial average up over 400 points to close yesterday at over 154,000 for the first time since September.

The industries most immediately affected are those manufacturing weapons and spaceships, of course. Boeing-Lockheed, setting up for the conversion of 126 Katana fighters, leads the list of firms benefiting from the latest military appropriations, but there are nearly three thousand others on the list of contractors receiving orders yesterday. Everything needed for space combat, from thermal underwear to T-rations, is being rushed into production.

Experts are divided in their opinions on the **benefits** of this military production surge. Some are optimistic, pointing out the "ripple effect" as money pours into key industries and spreads into local communities. Others claim that gains will be **short-lived** and limited to a small part of the overall economy, tapering off quickly as soon as the war winds down. The most pessimistic call attention to the vulnerability of Solaria's supply line--

that tenuous arc of ore canisters tumbling toward Earth from the asteroids. If mining is interrupted by fighting in the Trojan group for any length of time, they say, Terran industries will collapse from a lack of raw materials, regardless of the demand for their products.

One dark cloud on the horizon is the possibility of strikes. Major labor union leaders met yesterday to discuss strategies to fight extensions to the current ten-hour work week, which they believe will be proposed by the administration. "It isn't a question of patriotism," WFL-CIO president Telford Rodney said in a prepared statement after the meeting. "We're as patriotic as anyone else. If overtime is needed to meet the demands of the war effort, we're willing to put it in. What we're opposed to is legislation that will increase the basic straight-time work week and negate gains that we've had to fight for over the years. If President Spelnikov or anyone else introduces a bill to increase the week to twelve or fourteen hours, we'll oppose it. We'll oppose it with every resource at our disposal."

But in spite of the fears of the doomsayers, the economy already shows signs of responding positively to the war news and armament orders. A rise in employment offers has been reported, and **Solarian** currency value remained stable in trading yesterday and today after weeks of fluctuation. Barring loss of the Trojan asteroids to the Andromedans, most experts are predicting steady growth during the war, with the establishment of many new companies which should remain in business after the war ends.

ENGINEERING: THE KATANA

The government's announcement of plans to produce several hundred SF181 Katana fighters for use in the Andromedan war leads to a number of questions in most people's minds. What is a Katana? What does it do? How does it work?

Basically, the Katana is a combat conversion of the common lifepod-class personal spaceship. Twin lasers, a Falcon missile launcher, deflector shields and a high-performance drive transform a prosaic four-passenger transport into a deadly single-seat attack vessel. But is it deadly enough for the coming conflict? Can it beat ships designed purely for war? Experts say yes.

"Look, those lifepods are first-rate ships to start with," states UPSF flight instructor Maj. Noam Goldberg. "With the weaponry and enhanced power and defensive capabilities, the Katana is just that much faster and more maneuverable, and it hits harder than anything else of the same size. It's a great little fighter."

Among the sophisticated features of the Katana is its fully independent system design with automated Maintenance-And-Repair Systems (MARS). Each weapon, defensive and drive system functions alone, meaning that damage to one will not decrease the effectiveness of any of the others. Furthermore, each system's MARS robotics will repair damage to the system—short of complete destruction—although repairs naturally take time. Only catastrophic hull damage will completely knock out a Katana, say boosters. Less-serious loss of hull integrity can be repaired at a space station or outpost.

The Iacocca M7B fission-fusion drive retrofitted to the Katana is the most powerful ever used in a ship of this mass. It is controlled by the newest Spencer Velocity Master Module, which automatically applies the correct acceleration vectors so that the speed of the spaceship does not change more than necessary during turns, allowing the pilot to simply steer the craft like a ground vehicle.

The Spencer VMM also reduces speed by half in the event of a shielded collision with other objects to ease corrective steering during bounce-back.

The Lear M99A/V hyperdrive makes warp speeds far less risky than in the past. Discontinuities in non-Newtonian space (warp storms) can still throw a Katana off course, but not so far that the on-board navigator/locator can't pinpoint the ship's new coordinates. Like any hyperdrive, the M99A/V is a fuel guzzler, allowing the pilot only one long warp jump per flight, but this is not considered a serious limitation.

The steering engines serve as auxiliary drives if the main Iacocca unit goes out of service. However, acceleration using auxiliaries is only 25% of normal. Available top speed is of course unaffected, but ship response can be dangerously sluggish during combat. There is no obvious solution to this problem, since the steering engines can't be driven harder without overheating.

The Katana pilot is covered by two layers of protection. Outermost is the Ksoingi Mark I energy shield, a fully transparent decelerator/absorber field. While raised, the shield will significantly reduce kinetic or electromagnetic energy reaching the hull, but it does drain the fuel supply. (The Mark I is an "active" shield, requiring constant energy input. The more sophisticated Mark II "passive" shield operates on attack energy alone, but is not suited to a ship of the Katana's size and configuration.)

The inner layer of protection is the hull itself. Constructed of a titanium / CB fiber / duralloy "sandwich" material, the hull is light, rigid, and incredibly tough. (Fortunately so, because complete hull destruction is invariably fatal to the ship and pilot.)

Missile handling and launching is provided by a Von Braun GmbH integrated launch system mounted to the ship's belly. Capacity is 15 Falcon ion-thrust torpedoes fitted with variable-yield directed-burst fusion warheads. Warheads are activated at launch, and detonate on detecting engine heat within 100 meters. Burst yield is sufficient to vaporize any

spacecraft. Impact fuzing causes detonation on direct hits to inert (ambient-temperature) objects.

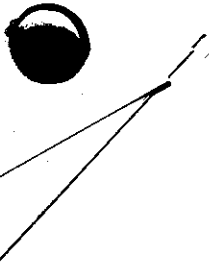
The Katana is also equipped with two cannon, modified from Eastman Industries' 18-gW. pulsed-laser drill/cutters. Speed-of-light beam travel, micro-collimation and airlessness combine to give the laser cannon near-infinite effective range in space, but their destructiveness is severely limited by reflective plating. An Andromedan warship, for instance, is laser-plated on all surfaces except its belly and extreme rear, where heat-exchange tubing and drives are located.

The laser systems require massive electrical charges to fire. Each firing consumes half the available charge, so rapid shots become exponentially weaker—"machine gunning" is a useless tactic. However, if a laser system is undamaged, it will automatically recharge itself after firing, so the "ammunition" supply is constant as long as the ship has fuel and the pilot remains calm.

Finally, while exact details of its operation and implementation are secret, there is no question that the Tokimara navigator/locator system may be the Katana's most advanced feature. The system uses a unique combination of hardware and software to generate a simplified grid-map, pinpointing the pilot's exact location in space. Once a destination is chosen on this map, the system projects a white square on the ship's forward viewport showing the location of the destination, allowing the pilot to simply steer toward it, leaving complex calculations strictly to the computer.

The system possesses other map functions, such as magnification of chosen areas, and color-coding of mapped objects for ready identification.

Judged simply on the merit of its systems, the Katana seems ideally suited to the job of single-person deep-space fighting. But only time and the experience of its pilots in combat can determine if such a judgment is accurate.



SOLAR SYSTEM TODAY,

NEW BIRMINGHAM, LUNA

ANDROMEDA INVADES TROJANS

Poirrottown, Herculls Quadrant, Trojan Group, June 4--Andromedan warships today attacked Solarian lifepods near here. Six lifepods were approaching a number of unidentified vessels to exchange greetings and news--common belt practice--when the vessels opened fire with beam and projectile weapons. Five of the lifepods were destroyed within ten seconds. The sixth, which beamed video shots of the attack back to the landing field control tower here, was obliterated moments later. All six Solarian pilots were lost.

Subsequent attacks in the next twenty minutes succeeded in destroying most of the outlying Poirrottown facilities which might otherwise have served as defensive outposts. The number of known dead continues to rise, and is expected to exceed 200.

Transmissions between the attacking ships were recorded, and are in Thikval, the language spoken in the Andromedan Hegemony.

It is believed that the three cruisers detected so far, with their supporting convoy of smaller ships, constitute the vanguard of a far larger fleet. A full-scale invasion is expected shortly. Experts state that the Andromedan military considers Herculis as the gateway to United Planets territory.

Poirrottown sustained heavy damage in the attack, although there were relatively few casualties in the base itself. This damage, combined with a recent shut-down of backup facilities for repair and renovation, leaves the base with little remaining defensive potential.

FREE PRESS,
TRAVERSE CITY,
MARS

TECHNOLOGY: KSOINGI CRUISERS

Poirrottown, Herculls Quadrant, Trojan Group, June 4--The large Andromedan vessels which caused the greatest damage here today have been identified as Ksoingi-class cruisers. Cruisers of this class are informally known as "planet-busters" among UP naval personnel. A single Ksoingi cruiser is capable of vaporizing a base the size of Poirrottown with one shot at close range. The damage here today was heavy in spite of the fact that the cruisers fired from near-maximum range.

Fighting these cruisers is considered "tough, very tough," says Capt. Kenneth M'Kando. "It takes a perfectly-centered hit from a missile to penetrate both shield and hull armor. They're so tough they can even take a collision with another ship without damage. Consequently, the Andromedan cruiser pilots just ignore enemy ships unless they're close, in which case they just turn and try to ram. At that point, you've got two choices: try to sneak a missile in before he hits you, or run away."

Tough, indeed.

The Trojan Group

In the early days of space travel, when the outer planets were just being settled, travel between Mars and the moons of Jupiter was a risky business--the dreaded part of any interplanetary flight.

The reason for fear was an asteroid belt so thick in places that early 21st-century spacecraft had little chance of getting through in one piece. The danger was such that it delayed discovery of the belt's mineral wealth until after the turn of the century.

It was only when the true magnitude of this wealth became known barely more than a decade ago that the hazards of traveling among uncounted thousands of chunks of rock were deemed acceptable.

One of the problems--and to some, one of the joys--of exploring the belt is the isolation, the remoteness. The nearest large body is Jupiter, casting a warm red-orange light that belies the bone-freezing cold this far from the sun. The first-time visitor is invariably struck by the stark contrast between the beauty of his surroundings and the danger they represent.

"Stark is the perfect word for it," says Noah Stonewell, the well-known painter who spent several years as a contract prospector traveling between the asteroids. "Stark, and desolate, yes, but it's beautiful, too. Trouble is, you can get mesmerized by that eerie beauty. You don't realize that it's why you feel depressed so often. It's like a drug; it's bad for you, but you can't stay away from it. I still miss it."

Research studies corroborate Stonewell's description. Over time, living alone in the belt results in generalized depression. Even more serious mental disturbances are common among sensitive individuals. Fortunately, the cure for the so-called "rock-crazies" is simple: companionship. The problem simply does not occur when two or more people live together in the belt, and belt residents today frown on anyone spending more than a short time alone.

The Trojan Group takes its name from "Trojan point," a region where the intersecting gravitational fields of two bodies, like Jupiter and the sun, act to draw objects together. Trojan points were predicted by mathematician J. L. LaGrange nearly two centuries before spaceflight became possible. Over millions of years, this Trojan point near Jupiter has collected rock ranging in size from microscopic to dozens of kilometers across, with the result that asteroids are clustered much more thickly than elsewhere in the belt, although by Earth standards the rocks in the Trojan Group are very thinly scattered indeed.

Astrophysicists theorize that the asteroids may be the remains of an Earth-like planet which was torn apart by tidal stresses. This view is confirmed by the presence of high concentrations of heavy metals in many asteroids, since such metals are believed to make up the Earth's core.

But while the metals of the Earth's core are inaccessible by any known mining methods, those in the belt are freely available to anyone who can get there. And efforts to mine the asteroids have been highly successful. Vast chunks of nearly-pure iron, titanium, tungsten, zinc, copper--all the metals which have become so scarce and expensive on Earth--require only patient searching to locate. Today a "pipeline" of cargo containers spirals in toward Earth's orbit, supplying the needs of industry on a constant basis.

One of the most pressing needs, for industry and private citizen alike, is the need for fissionable material. While the belt cannot be said to abound with uranium and other radioactives, these metals are found mixed with more-common materials in trace amounts. Because of the vast quantities of metal processed, uranium in sufficient quantities to supply Solaria's needs appears as an almost-accidental byproduct of refining. Thinly laced through the belt rocks like the stars in the black space that surrounds them, the fissionables accumulate during ordinary chemical separation of other metals. Fuel production has become profitable enough to nearly pay all the vast costs of opening the belt.

(CONT'D FROM LAST PAGE)

Exploitation of the belt began shortly after a government-sponsored exploration vessel first reported finding concentrations of metal in 2107. Recognizing the huge potential for profit, entrepreneurs quickly began forming the cartels and syndicates necessary to raise the capital needed to finance mining ventures in deep space. In only a few years, these companies had begun the process of refining metals and "dropping" them to Earth's orbit.

But while the intent of the mining installations was purely commercial, one of the major results was social: today many communities exist, even thrive, in the Trojan Group.

The Group is arbitrarily divided into four quadrants, each roughly centered on a base planetoid. The quadrants--designated Copernicus, Nova, Trojan and Hercules--are further subdivided for navigational purposes into a grid of smaller sectors. Although the quadrants are each considered politically and economically autonomous Solarian states, in practice there is a strong unwritten alliance between the quadrants based on social and corporate ties.

As might be expected in a new development, the facilities to be found at a planetoid base are modern and sophisticated. Full remote-control guidance systems make landings simpler for spaceship pilots; there are full-service repair facilities, ComNet links, provision warehouses and equipment depots. Leisure-time facilities run the gamut from free-fall discotheques to sushi bars. Of course, the bases are meant to be utilitarian, and have a bare-bones appearance to the typical Earth visitor. It is easy to believe claims that such a base can shift within minutes to full emergency status, ready to handle the various disasters that were anticipated in its design, including attack by hostile spacecraft.

Mining outposts have been established or are being planned on the richest rocks near each of the base asteroids. Eleven outposts are in Copernicus, but because three of these were hit by commando raids last week, only eight are currently in full operation.

Two outposts are nearly ready to power up in Nova, the nearest--and most politically

active--quadrant. The more-distant Trojan quadrant has three outposts finished and waiting for staffs to be recruited on Earth. (Although mining has not yet started in the Trojan quadrant, start-up settlers have established amenities for visiting ships.) Only Hercules, the most remote quadrant, has no outposts.

It is on the outposts that the miners and the people who supply them live and work.

It's a lonely life.

"Even if you were a loner in a normal population," says Greta Hughes, a foreman at the Einstein Mine Complex on Epsilon, "when there's only a few of you and no one else for millions of miles, you tend to want to spend just about all your time with other people."

As a result, the second largest industry at every outpost is pub-keeping. Not only because a warm, friendly bar is a good place to spend lonely hours after a long day's work, but because it is where the occasional visitor from elsewhere in space can be met. Strangers provide welcome variety after weeks or months cooped up with the same few faces.

Certainly the outposts seem to have little to offer someone used to endless planetside diversions. Since only basic needs can be handled through the weekly deliveries from or monthly trips to the central base planetoid, little consideration is given to the extras available in larger communities. The outposts can't even provide refueling to visiting ships. Fortunately for the pilot experiencing ship problems, however, outpost personnel tend to be very competent mechanics and technicians, and the outposts have gained a reputation for fast, first-rate ship repairs.

Among belt residents, though, it is the outposts' saloons which give them their greatest renown. So, if there are horses in our modern Troy, they surely must be Clydesdales.

PHYSICS: ANTIMATTER SHARDS; NOT UNSERIOUS

Asteroids and bellicose Andromedans aren't the only hazards in the Trojan Group. Several areas are essentially unnavigable because of drifting clusters of antimatter shards that wreak havoc with spaceships.

When such a shard touches an ordinary object, it obliterates exactly its own mass of matter (in fact, the only known way to "weigh" a shard is to measure the amount of matter it destroys). Although it would normally take dozens of collisions with antimatter shards to destroy a fighting-fit Katana, even one could do the job if it struck the right place. If the craft has already been damaged by combat or collisions, the danger is greatly magnified.

These shards are believed to be the only remnants in this galaxy of the vast quantities of antimatter created during the "Big Bang" at the beginning of the universe, the rest having destroyed itself in collisions with matter eons ago. For years, asteroid miners have systematically destroyed concentrations of shards as they discovered them by the simple expedient of pushing rocks to collide with the shards, but eliminating all of them is expected to take centuries.

Shards do tend to stay in the same general area in space, but they exhibit an odd characteristic motion, orbiting about each other in a single plane, thus producing a disc-like array of "non-objects." The reason for this behavior is unknown.

The pilots of craft assigned to research the shards have provided what little is known about the hazards of navigating among them. Says Sally Bly, highly-skilled ex-shard-research pilot, "You have to figure the plane of their circling, because they never leave it. Then if you're quick, you can fly past parallel to it. You have to be quick, though, because the plane can shift.

"I don't recommend anyone go any closer to antimatter shards than they have to. They are very anti-funny things."

PHYSICS: HERE WE ARE, THERE WE ARE

United Planets fighter pilots have a technological advantage when the battle's in the home court. The UP's strategically located jump gates provide a free ride through hyperspace to anyone who knows how to use them.

Although details are secret, it is known that a jump gate almost instantly propels a ship entering it properly to another, preset point in space, almost always within the same quadrant. The last consideration may be the device's greatest drawback, as the pilot has no choice of destination, but always arrives at the same place.

Nonetheless, UP pilots who know the destinations available from the different gates have found JGs to be invaluable time- and fuel-savers on even routine missions. Veteran spacemen believe the gates will be an enormous advantage to UP fighters in battle with Andromedan invaders.

The method of entering the jump gates is, if not secret, hard to explain. Veteran Owen "Eddie" Jaeger summed it up as lucidly as anyone:

"Fly up to the gate, go through the exact center, and Bingo! You're somewhere else."

When pressed for further details, Jaeger demurred, explaining that gates have psychic effects on pilots, causing each to perceive them differently and requiring a trial-and-error learning technique by each.

Jaeger did express some disdain for the younger generation's reliance on the Tokimara locator to find gates on the computer-generated map by their characteristic rectangles. "In my day," he says, "you had to navigate by eyeballing the Sun and the bigger rocks. You had to know something to find a jump gate. These kids have it too easy."

SIMULATOR NEEDED

The current war in the asteroids is already challenging software designers to produce simulators to teach the techniques of spacefighting.

The task would be easier if current fighters used a higher level of weapons automation, but Katana spacecraft do not yet possess "kill-on-detection" systems. Effective training demands that simulators stick to what is possible with real existing equipment. This means teaching would-be pilots to fly and shoot using their own intelligence and reflexes.

Fortunately, the principles of spaceflight allow straightforward mathematical modeling, and the interface design of Katana control systems lends itself to computer emulation. Let's look at what the designers are working with.

The laws of motion apply to spacecraft in their purest form. Left to itself, a spaceship will travel a straight and steady course. It takes force to alter its path. This force can come from the ship's engines, gravity, or collision with another object. Speeding up and slowing down simply involve firing the appropriate engine fore or aft.

Turning is more complex, because it involves both rotating the craft and changing its direction of travel. In the old days, a spacecraft had to be turned so its engine would provide thrust in the proper direction for the desired vector, then the engine had to be fired to provide the thrust. Two separate operations. Furthermore, there was often no connection between the direction the ship was facing and the direction it was traveling. Calculations to plan turning maneuvers were long and complex.

Life is much simpler with a modern ship like the Katana.

Steering is now coordinated with turning. Although the ship CAN be turned to face in a direction other than the one it is traveling if the engine is off, steering while thrusting results in the ship responding to its controls like an airplane. This has been accomplished by developing complex shipboard computers which automatically control thrust intensity and direction to correspond with simple inputs. Like much modern technology, this system is internally very complex, but also very easy for a human to use. And, luckily for the software designer, this kind of response can be simulated quite accurately.

Last but not least, weapons must be simulated. Here the designer is on solid ground: weapons effects have been the mainstay of computer game design for a century and a half, and the technology is very well known.

So how is all this translated into a Katana simulator, and specifically a combat simulator for war with the Andromedans? Here are the requirements:

Motion of the ship and of other objects must conform to the laws of physics.

The joystick/keyboard Katana control panel must be duplicated.

The ship must respond realistically to control input, including staying aligned with its direction of travel.

Enemy ships must have the correct characteristics, and follow actual Andromedan tactics. This is particularly difficult to accomplish. Not only must each simulated vessel's motion follow the same rigorous physical rules as the Katana, but it must behave in combat as if an Andromedan were piloting. This requires development of sophisticated "intelligence" routines if the enemy ships are to carry out effective tactics, and not simply attack at random. A true challenge for the designer.

The area of weapon behavior may be the most fun for the designer, if

frustrating for the beginning user. Although laser beams reach their targets instantaneously for all practical purposes, missiles take time. And, although missiles obviously share the ship's velocity and acceleration until they are launched, changes in the ship's motion after launching a missile won't be imparted to the missile.

This is easy for a trainee pilot to forget, with the too-common result that a "perfectly"-aimed missile appears to curve off to one side, missing its target by tens of kilometers. What happens? Simple. Both the ship and its target are accelerating to one side--the missile just can't keep up. From the accelerating Katana, the Falcon's path appears to curve in the direction opposite to the acceleration.

Frustrating or not, this effect can be most-realistically simulated on a computer.

Many of the lesser details of a successful simulator are routine, if time-consuming to achieve. For example, realistic fuel-consumption in response to use of engines, lasers and shields is essential to teach beginning pilots effective ways to conserve energy. Only by learning when--and when not--to use ship's systems will the pilot be able to survive in actual combat.

Another example--the location of objects within the Trojan Group. Good simulator design demands that these be grouped according to the latest astronomical data. Major "landmarks"--the sun, Jupiter, Saturn and the asteroid Ceres--must be correctly placed to give the trainee a feel for navigating in the belt.

All in all, designing such a simulator is no easy task. But will someone do it? Count on it. In fact, given the state of current technology, it's safe to assume it's already done.

A NEW APPROACH TO AN OLD PROBLEM

Solarian pilots will find landing at planetoid bases in the Trojan Group easier than ever thanks to the recent installation of external-view-and-control-systems (EVACS) in UP-owned ships and landing facilities.

Using EVACS, a pilot flying into landing range of a base will find his/her view shifted. It will appear as if the pilot is seated in the base's control tower watching the ship approach from outside. This provides a much broader and more accurate view of the landing area than is possible from a viewpoint within the ship, and eliminates the need for trained traffic controllers in the tower.

Displaying the picture from a tower-mounted camera on the viewscreen of an approaching spacecraft was child's play,

according to EVACS developer Enzo Ferlioni. Creating software suitable for altering the response of the spacecraft to its controls to work with the new view was "tricky." "Yes," he says, "it took us nearly ten years of fine-tuning to get everything right. Now, we have the system to the stage where the interface is really intuitive."

Not everyone agrees, though, that the system is entirely intuitive.

"It takes some getting used to," states freighter pilot Yung Kim. "It's disorienting to suddenly see everything from such a different perspective, and of course when you see the ship 'coming toward you,' all the controls appear to be reversed. Really, it's a lot like flying a remote-control model airplane back on Earth, although there's not enough gravity to worry about, and there's no wind."

Pilots experienced with the system state that it is not difficult to learn, and the key to success at first is executing maneuvers slowly while using all the system's features.

Kim says, "I don't have any trouble with EVACS now. It would have been even easier to begin with if I'd paid more attention to the small auxiliary screen beneath the main display. That shows the ship's attitude as seen from the tower, and is really helpful."

Although landing at a planetoid base will probably always be harder than docking at an outpost--where it's only necessary to line up with the triangular docking door so the tractor beam can pull the ship in--EVACS already appears to be an improvement on past methods. Flight instructors report a 40% reduction in the time necessary to teach new pilots to land.

EDITORIAL: A CALL TO ARMS

With this issue of Time, we depart from our normal policy of providing the broadest possible coverage of different topics, and concentrate entirely on matters relating to the present war in the Trojan asteroids. In our opinion, the Andromedan invasion of Solarian territory is more important by several orders of magnitude than anything else happening this week. It would be a dereliction of our duty to devote our pages to less serious events.

For, whatever else you might think, do not doubt that this war is serious indeed. If Andromeda is successful in obtaining control of the Trojans, the welfare of every man, woman and child on this planet will be threatened. Nay, more than threatened: at best we will be enslaved, and at worst four million years of human evolution will end in the extinction of our species.

This war is different from any that mankind has ever experienced. For the first time, we fight a species other than our own. For the first time, our soldiers meet an opponent who will not, cannot, exercise the human qualities of compassion, empathy or mercy. And we cannot afford to forget that this enemy is inhuman, because forgetting will be fatal.

What is an Andromedan? In appearance he--no, it--resembles an eight-foot lobster, but is even more alien than that--we are more closely related to lobsters than are the Andromedans. Our soldiers call them "Bugs," (not without justice, for their social structure is insect-like), but these are bugs with an active and aggressive intelligence. Bred in massive warrens as on an assembly line, genetically "designed" like so many machines, programmed for specific tasks, the Andromedans contain no semblance of anything we associate with fellow thinking beings. Except for the Queen caste, their rulers, the Andromedans are merely biological mechanisms, living robots incapable of feeling or original thought.

This explanation is necessary because some well-meaning Solarians would credit the Andromedans with the attributes of humanity. These people believe that we can deal with the Andromedan Hegemony peacefully, as we have dealt with other nations in the past centuries. Although their pacifistic intentions are praiseworthy, these people are wrong. We cannot deal with the Andromedans in any way except to reply in kind to their act of war. We must fight them, and we must destroy any who enter Solarian space.

So let no one hesitate when called for military service. Let no soldier hesitate to fire at the Andromedan in his sights. Only when the last Bug warrior is obliterated in our solar system will the Andromedan rulers see the futility of their aggression. Only then will they negotiate with us as they should have negotiated before.

Only then will there be the peace we all want.

THE ENEMY ARSENAL: ANDROMEDAN WARCRAFT

Although active wars ceased in known regions of the galaxy over a century ago, the development of weaponry has never quite stopped. New technologies tend to drift into the armaments arena whether or not there is a use for improvements.

This has been particularly true within the Andromedan Hegemony, which has traditionally achieved its foreign-relations goals through threat of war even when actual fighting has been unnecessary.

We contacted Andrew McCullough VI, specialist with the research staff of Jane's--the distinguished compiler and publisher of ship data for over four centuries--for information on Andromedan spacefighting equipment. Following is a brief synopsis of what he told us:

The Andromedans currently have five types of warship in space, each with its own characteristic strengths and attack pattern.

The MUG **"Dagger,"** identified by violet armor and green fins, is fast and quick-maneuvering. These characteristics were achieved by using a minimum amount of armor to reduce mass. The Dagger is equipped with a single bow-mounted laser cannon.

Observations during last year's Andromedan battle exercises near Betelgeuse indicate that Dagger pilots favor a fast head-on attack technique to take advantage of their lasers while minimizing the risk of being hit.

The **"Mace"** is blue with orange fins. It is almost opposite to the Dagger in design, in that it is armored to the point of being

ponderous. The Mace is fitted with a plasma cannon that fires superheated fireballs.

Mace pilots tend to approach an enemy vessel slowly from the rear, then launch fireballs from close range.

The blue-finned orange **"Flail"** is a slightly modified Mace, equipped with a high-powered laser in addition to its plasma cannon. The approved Flail tactic seems to consist of circling an opponent while maintaining a barrage with both types of weapon.

The **"Hammer"** represents a departure from normal warship design, in that it is itself a weapon. These cheaply-built, inefficient ships are merely piloted bombs. They possess little or no armor, and have a collision-detonated thermonuclear weapon integrated into their bow structure. The Hammer pilot's sole tactic is to come straight at an opposing ship and attempt ramming.

Hammers are characteristically green with violet finning.

Not even Jane's knows much about **"Swords,"** the Ksoingi-class heavy cruisers that are the newest addition to the Andromedan fleet. Says McCullough, "The Sword may be the first entirely new military craft built in the last century." These cruisers are known to have participated in the attack on Poirrottown in Herculis Quadrant, but were not scanned at close range.

With the possible exception of the Sword, Andromedan war vessels normally lack laser-reflective plating on their belly and tail surfaces. This weakness is a result of the need to dissipate engine heat through these surfaces, due to the relatively inefficient drive used by the Andromedans. UP tacticians theorize that Katana pilots may be able to capitalize on this "soft white underbelly."

MEDICINE: A NEW PLAGUE THREATENS

Galaxy City, Terra, June 2--Solarian Intelligence Agency chief James Elliott today reported the discovery of dozens of alien canisters orbiting the sun in a remote sector of the Trojan Quadrant.

Long-distance scanning and X-ray spectography show the canisters contain a powdery substance saturated with Biotek-M in quantities capable of wiping out all life on the United Planets in a period of weeks.

Biotek-M is a toxic biomutagen for which there is no known vaccine or cure. It causes a nerve disease which is both virulent and highly communicable. It is believed to affect all higher-order vertebrates, including human beings.

The SIA team which located the canisters was acting on a tip from a "highly confidential" source. There is speculation that this source may be a clandestine agent within the Lennut, an Andromedan terrorist group.

UP Public Safety commissioner Theodore "Tip" Hart has issued a call for volunteers to destroy the canisters and their sinister contents, which may be in down-orbit toward Earth. The SIA vessel which located the toxic material was equipped only with laser weaponry, and was unable to damage the bright-plated "lasersafe" canisters.

Biotek-M, named for Isaac Ben Markkula, the biopathophysicist who isolated it forty years ago, was first encountered by humans during the tenth year of interstellar flight. It is presumed to have arisen from the accidental crossing of otherwise harmless agents, possibly from different systems.

Markkula discovered within the Biotek-M cell peculiar viral molecules which he dubbed "steves." These steves occur in two types: the "J" and the "W," so-called from their shapes. Although on some occasions Markkula observed the two types in apparent cooperation, for the most part they conflict violently, causing severe agitation in the living medium surrounding the Biotek-M parent cell. If that medium is a human body, the inevitable result is bad. The victim experiences feelings of uncontrollable, terror-level paranoia, followed in short order by shock, coma and death.

The lethal and contagious nature of Biotek-M was horribly demonstrated eight years ago when nearly 7000 people, the entire pioneer population of the planet Trameil in Pisces, died in less than a week following a single settler's exposure to a dropped test sample bottle. This incident prompted passage of UP legislation outlawing further experimentation with the substance.

It is known that exposure to vacuum will destroy Biotek-M.