

SLOWLY UP THE HIGH ROAD.... Airships to Orbit

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TRANSPORT USING SOLAR POWER

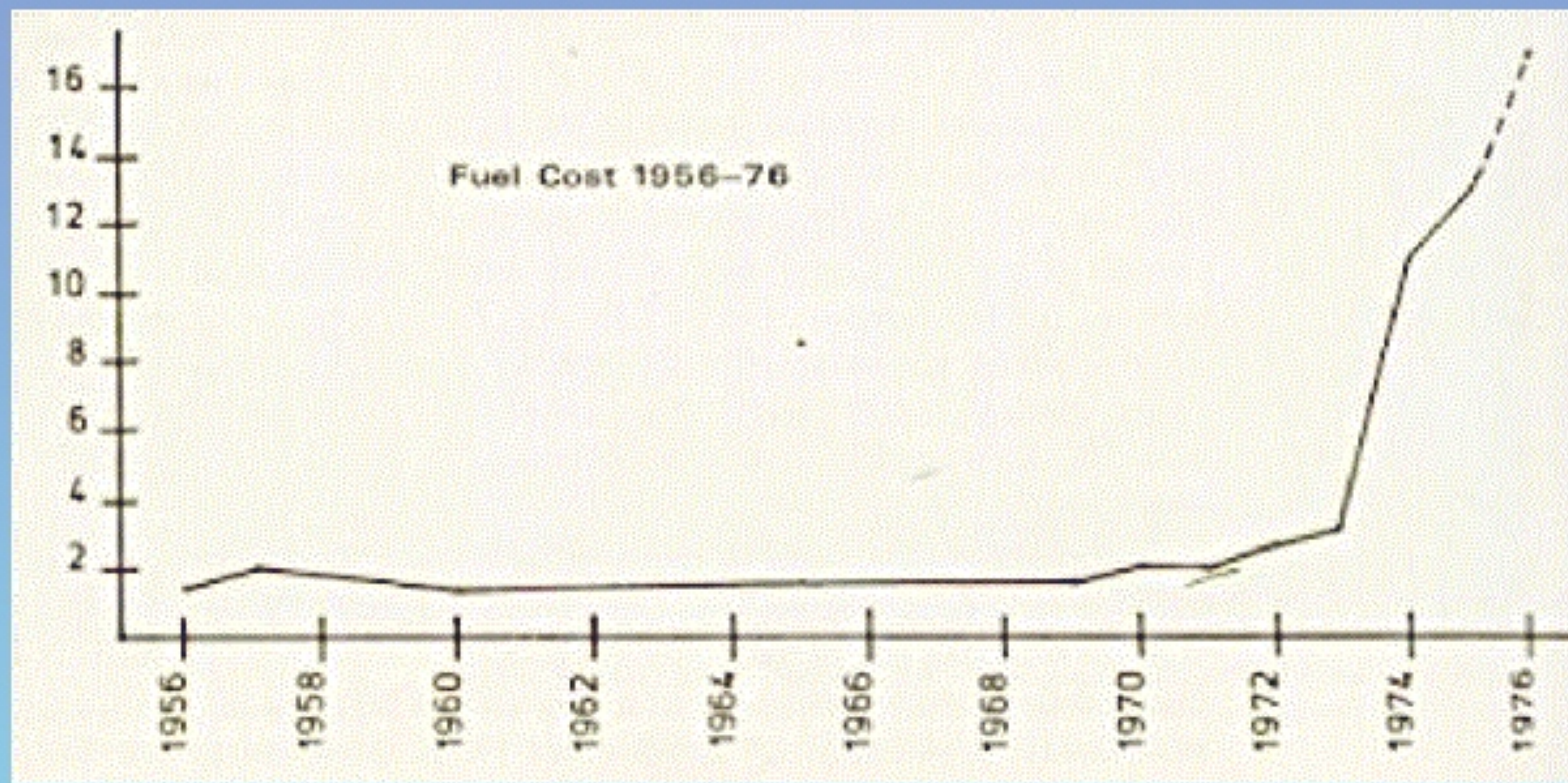
High cost fuel / Low cost electricity

Why look at solar power in the transport industry ?

- The basic operating cost of fuel for a fueled system is going up faster than the efficiency of the system can reduce them.
- The result is increasing costs despite the improvements in technology.
- The basic cost of the fuel per unit output in a fueled system is higher than the cost of a solar / electric replacement system.

FUEL COST CHART

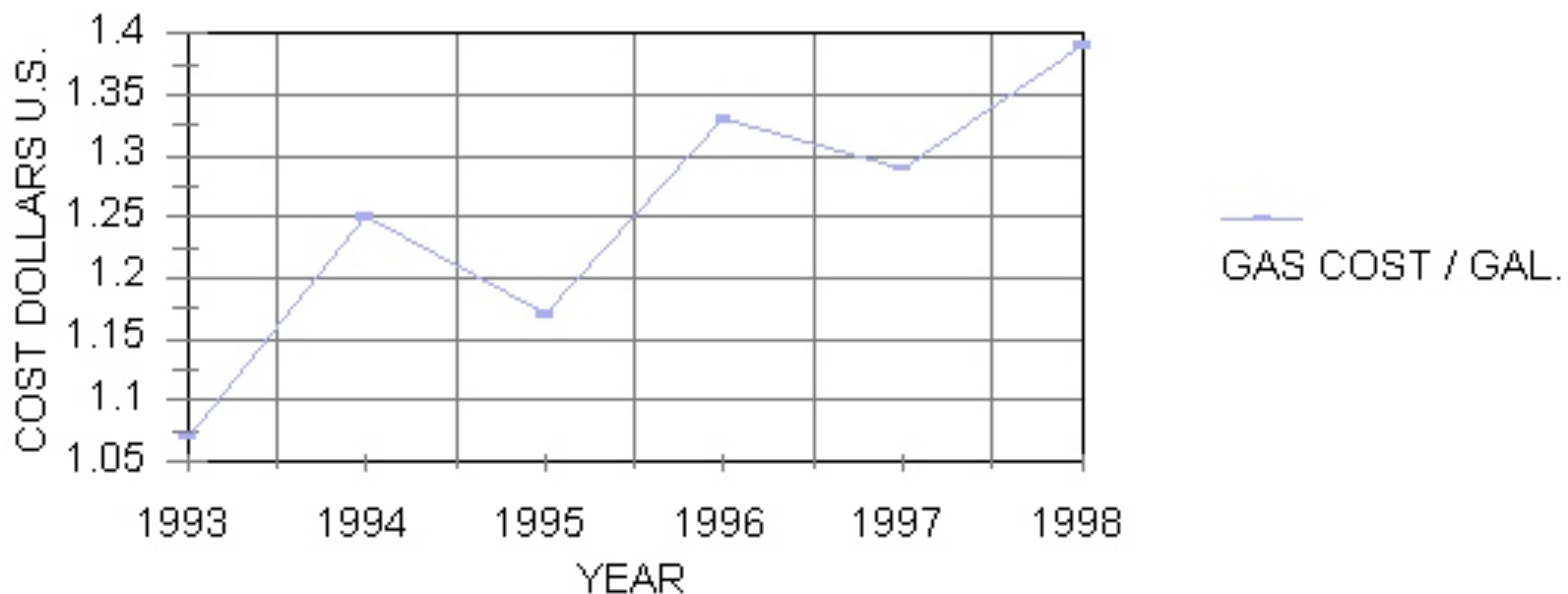
COST PER BARREL in US DOLLARS



FUEL COST CHART

LOOKS EVEN BETTER FOR SOLAR POWER NOW....

COST OF GAS PER GALLON 1993 - 1998



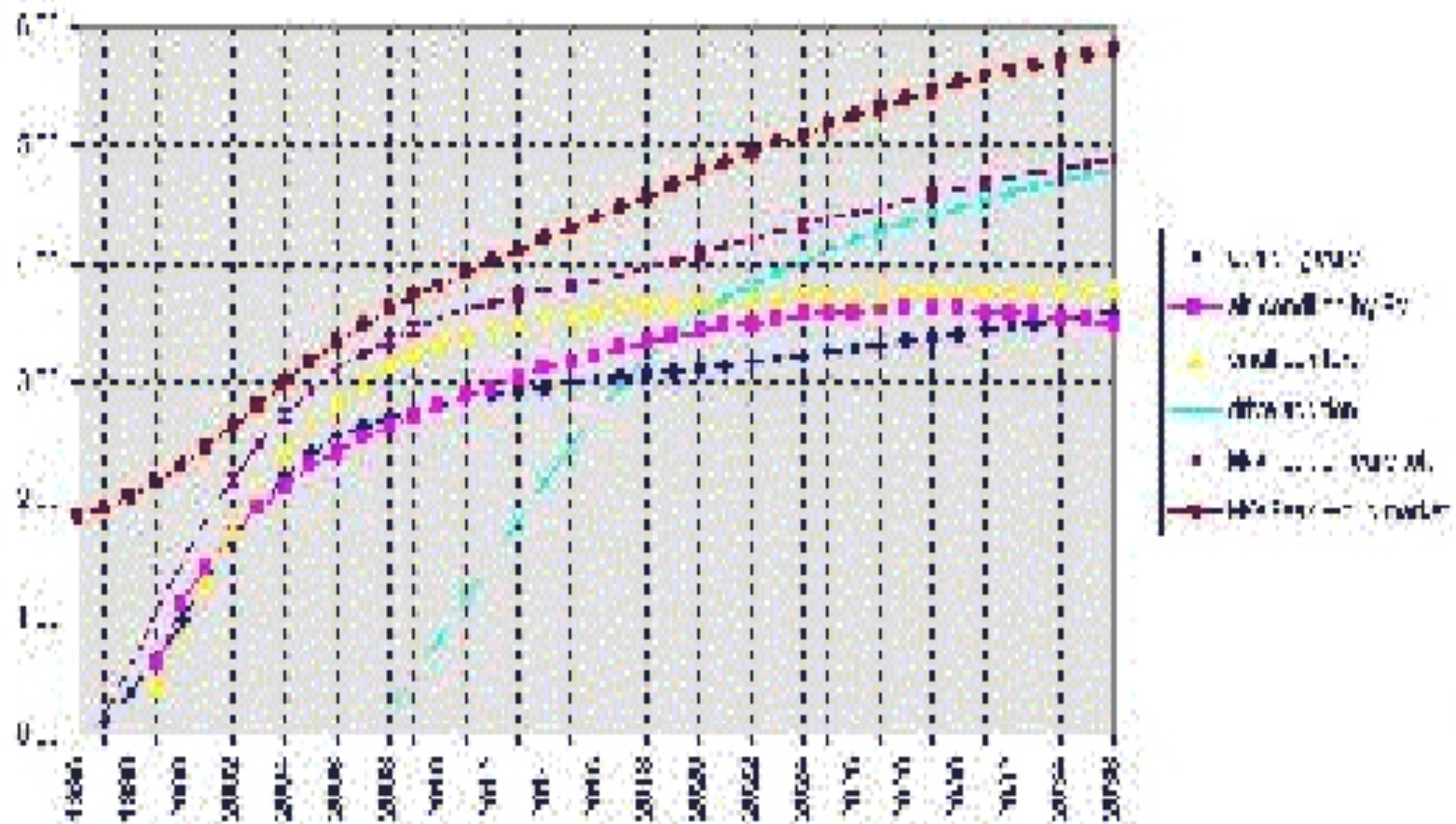
MOVING vs FIXED SOLAR POWER

Dams and other sources of cheap power

- Until recently both photovoltaic and solar thermal power systems were much more expensive than conventional hydroelectric or natural gas fired systems for generating fixed base electric power.
- The advent of cheap, thin film (but less efficient) Amorphous cells and production technologies from the electronics industry has narrowed the gap.
- However, deregulation and smaller profit margins may once again delay the solar option.

SOLAR CELL USE CHART

Photovoltaic world market logarithmic in 10^6 MW Peak yearly production



MOVING vs FIXED SOLAR POWER

- As a diffuse energy source, with limited hours of input, solar has two requirements: (1) to have large areas for energy input and (2) to have large storage media for continuous operation.
- While ideal for developing areas where there are no grid utilities, these two requirements make solar a difficult choice for automobiles, trucks, and other ground transport vehicles whose size is limited. Airplanes are even more difficult to propel using solar power due to their mass and high power requirements.

SOLAR AIRPLANES

Astro-Flight Sunrise II Nellis AFB Sept. 1975



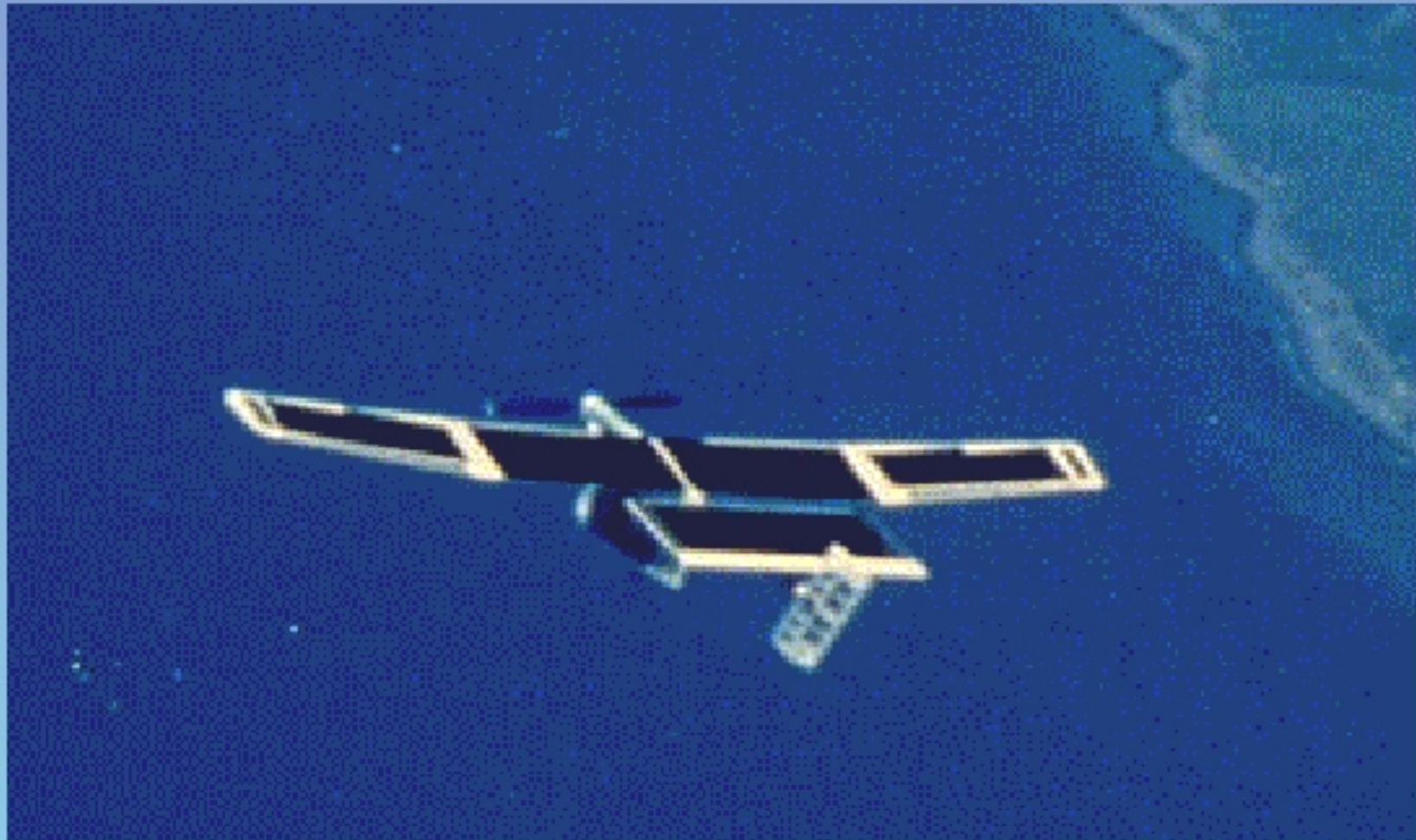
MANNED SOLAR AIRPLANES

Solar Penguin



MANNED SOLAR AIRPLANES

Solar Challenger



SOLAR AIRPLANES



Dryden Flight Research Center EC97-43955-7 Photographed Mar 1997

A sub-scale test model of the unmanned Centurion high-altitude flying wing now being developed prepared to land at El Mirage Dry Lake during a test flight. (NASA/Brent Wood)



MOVING vs FIXED SOLAR POWER

Storage.....The bane of electric transport.

- The low efficiency of today's electric storage systems, per pound of mass (batteries, fuel cells, flywheels) and their size, make them highly inefficient for even moderate distance movement of vehicles.
- Fixed base systems can use the power grid for storage and power can be stored from the grid during off peak hours.
- Unless an induction infrastructure is put in place, storage will be the main holdup for the implementation of electric ground transport, whether solar powered or not.

BOULDER DAM



FIXED POWER FACILITY

Improvements in Electronics



FIXED POWER FACILITY

Improvements in fluid dynamics



WHERE FIXED POWER CANNOT BE USED

You can't take it with you.

- Across the Oceans.
- Where transmission lines are a problem.
- Where “over the horizon” transmission is a problem.
- Where transmission of the power would interfere with the basic function of the device.
(I.e. a broadcast substation.)

MARKETS FOR MOBILE ELECTRIC POWER SYSTEMS

Why you WANT to take it with you !

- Because electric motors are twice as efficient as internal combustion (IC) engines.
- Due to the electric motor's increased reliability and its' lower maintenance costs.
- With few exceptions, the cost of fuel for IC systems is more than for comparable electric systems.
- Because electric motors contribute far less pollution into the environment.

STORAGE and HYBRIDS

The current way around the storage problem.

Hybrid fueled systems seem to present the best of both worlds...

- They reduce total fuel use by using the vastly superior efficiency of an electric drive system to move the vehicle. This eliminates or reduces systems mass by replacing inefficient mechanical devices with the unique capabilities of the electric motor.
- They reduce the storage problem by replacing large electric storage devices with a small high efficiency powered generator.

MISSIONS and VEHICLES

Who is using mobile hybrid NOW ??

Ocean Going Vessels **because.....**

- You can't send enough power across the ocean to run a ship.
- The increase in efficiency and reliability of an electric final drive system makes up for the additional cost of the system in fuel and maintenance.

MISSIONS and VEHICLES

Trains because

- The simplicity and reliability of an electric final drive eliminates the use of transmissions. With the motors acting as a regenerative “Brake” system, additional cost and complexity is also eliminated.
- The lack of “electrified” tracks and “road lines” outside of the cities, made these run hybrid. Inside of the cities, they can run off of the fixed grid system further reducing fuel use.

MISSIONS and VEHICLES

SUBWAYS / METROS / MINING TRAINS
because ...

- Electric power is mandatory in the confined spaces in which these systems operate. Electric power eliminates toxic gas production.
- By sealing the electronics, the hazard of an explosion is greatly reduced.
- Of the ease of availability of lower cost fixed base power transmission systems.

QUESTION ???

LARGE BOATS AND TRAINS OPERATE BETTER AS ELECTRICALLY POWERED VEHICLES..SO...WHY AREN'T THESE TYPE OF VEHICLES SOLAR POWERED ?

Why they aren't using SOLAR...

LARGE CARGO SHIPS...

- TRADITION....(Sailors understand SAILS...)
- It is easier and cheaper to put sails on the boats.....(Modern sail systems like the “Rigid Wing sail” can be completely automated)
- “They can be used at any time....day or night...the wind blows as much as the sun shines...”
- There's not enough surface area for the power demand. What surfaces there are take a beating.

Why they aren't using SOLAR...

TRAINS.....

- are already hybrid vehicles.
- Are easily changed over to completely electric inside cities....(Eliminating fuel costs and environmental issues....)
- Use “Induction coil-track / Smart-track”, an ultra-reliable power grid based source which eliminate the need for other power sources.
- Do not have enough surface area for the solar cells necessary to push their mass to high speeds or for grade climbing.

A vehicle which can EFFECTIVELY use SOLAR POWER

Using CURRENT technology and having broad MARKET application.

- To get the support of the solar industry (and their parent oil companies) the vehicle needs to immediately capture “Significant market share” while NOT interfering with current product markets. (I.e. the Status Quo)
- Be able to use CURRENT cell and storage technologies (and embryonic versions of new technologies).
- Be considered “technologically safe, have a history and be NEW & open new markets.”

A SUCCESSFUL SOLAR VEHICLE

What you need to make it work...

- Must have a large PAYLOAD capacity and be able to move it at equal or less cost than the competition.
- Must have SPEED (higher than competition)
- Must have LOTS of surface area for cell mounting...the more the better.
- Must be capable of running 24 hours a day...so it must carry sufficient storage.
- Must make a large impact on the contributing technology company's bottom line.
- Must be SAFE !!

A SUCCESSFUL SOLAR VEHICLE

Most importantly....

**IT MUST NOT NORMALLY
OPERATE ANYWHERE NEAR
THE CONVENTIONAL,
GROUND BASED POWER
GRID!**

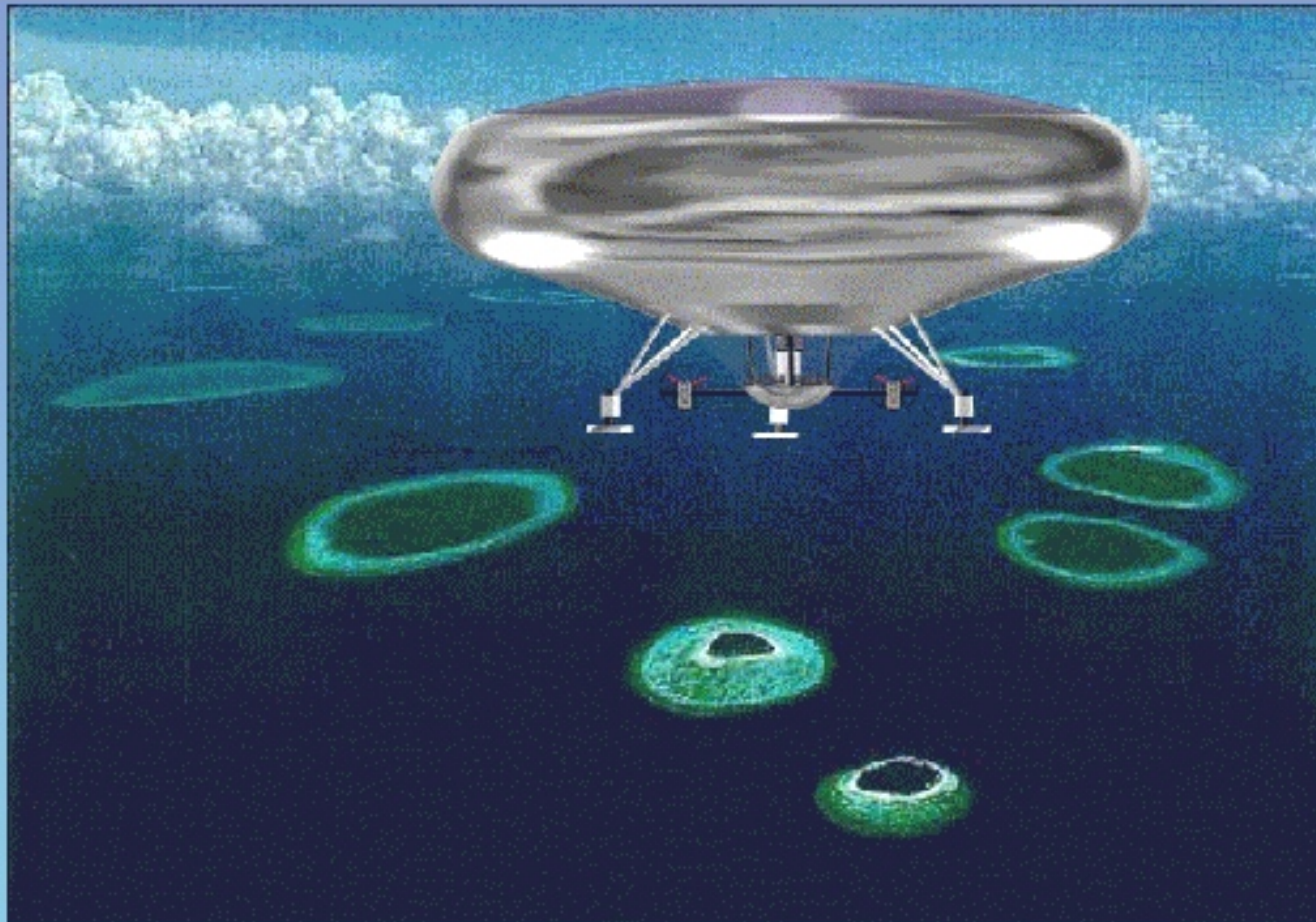
If the grid can run it, then solar power will not be cost competitive.



THE SUCCESSFUL SOLAR VEHICLE...

THERE IS A VEHICLE THAT FULFILLS
ALL OF THESE REQUIREMENTS !!

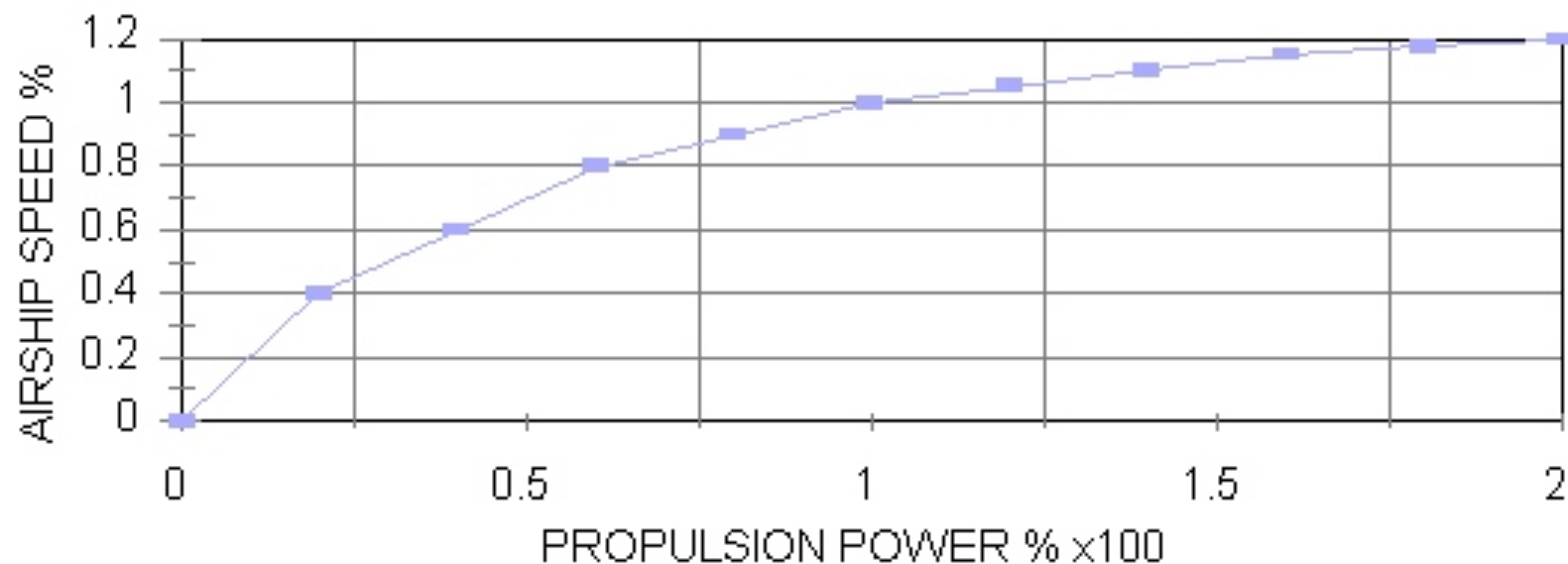
L.T.A.S. CORPORATION'S LINE OF SOLAR AIRSHIPS



WHY AIRSHIPS ?

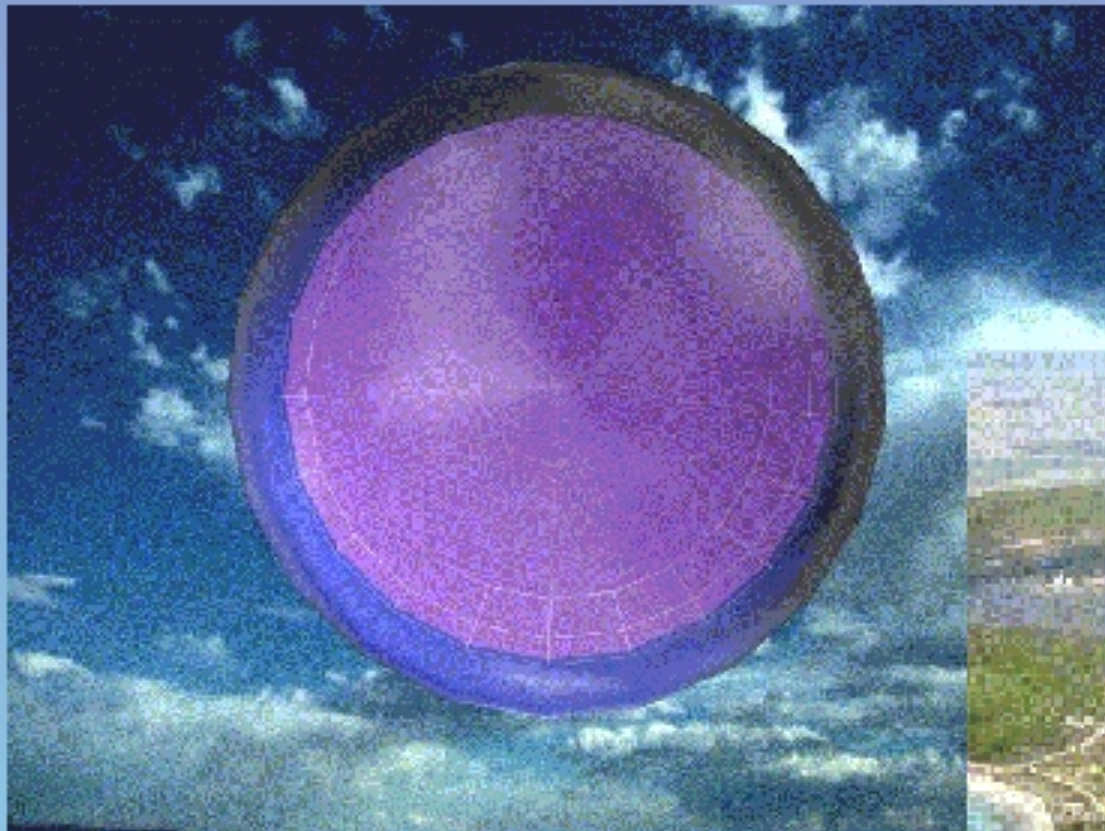
LOW POWER DEMAND, LOW STORAGE DEMAND...

AIRSHIP SPEED vs POWER %



WHY AIRSHIPS ??

LOTS OF SURFACE AREA FOR CELLS.



WHY AIRSHIPS ??

IMMENSE PAYLOADS...

The “Square / Cube Law” Makes it easy...

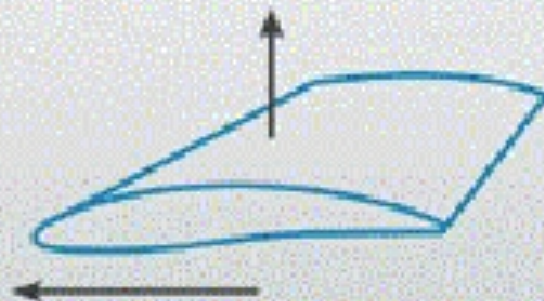
HTA

2 x size = 4 x lift

LTA

2 x size = 8 x lift

Heavier-Than-Air



Dynamic Lift from:

1. Wing **SURFACE**
2. **Speed**

Lighter-Than-Air



Static Lift from:

VOLUME of Gas

IMMEDIATE MARKET SHARE

Designs that don't need to be "Certified"

The remotely piloted CAMBOT and larger HIGH ALTITUDE OBSERVATION VEHICLE can be prototyped immediately with known markets in news gathering, traffic observation, patrol, fire watch, resource / wildlife management.

- As remotely piloted vehicles (RPV's) they do not have to be FAA certified.
- They are low cost technology demonstrators which have immediate use but open new markets.

REMOTELY PILOTED VEHICLES



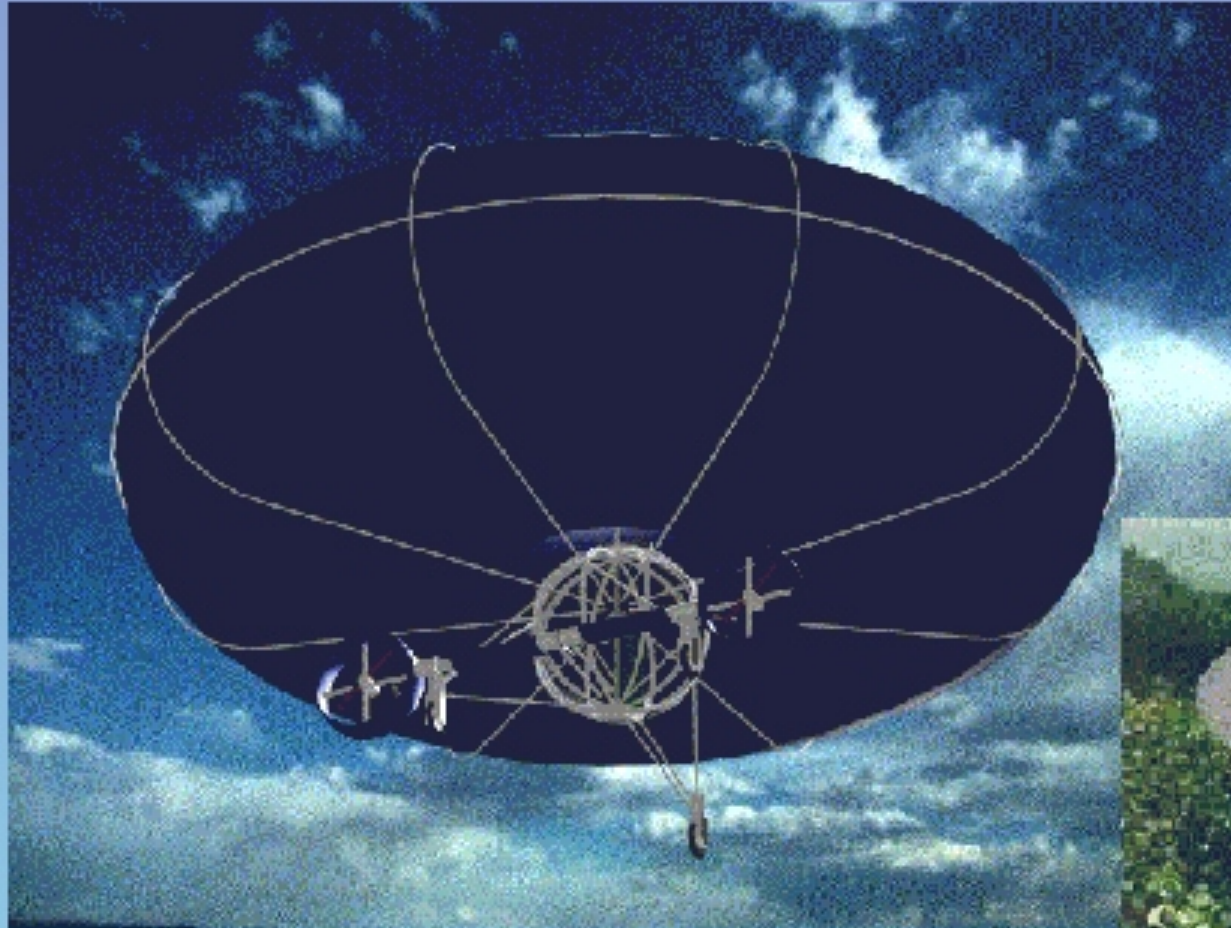
INITIAL MANNED PHASE

NO CERTIFICATION NEEDED...

- Use tested RPV hull system.
- Unit is classified as an ultra light.
- Instrumentation, navigation, communications and control systems will be tested at low altitudes.
- Hybrid power systems can be demonstrated for range and speed.
- Immediate sport, data gathering, patrol and advertizing marketability.

ULTRA LIGHT DESIGNS

STILL NO CERTIFICATION REQUIRED



CERTIFICATION PROGRAM

WHAT YOU HAVE TO DO TO CARRY PASSENGERS.

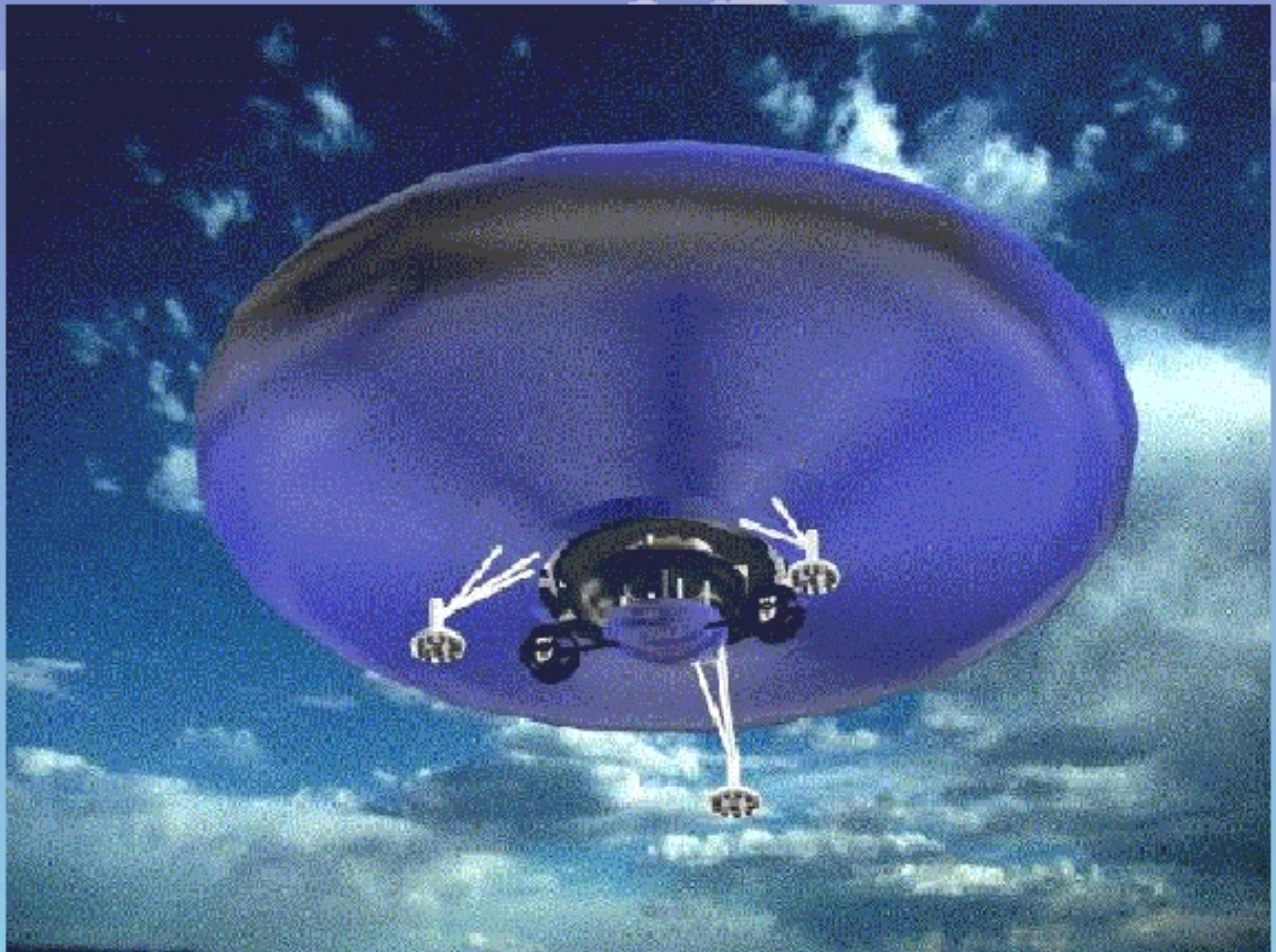
Plans for a system demonstrator must be submitted to the Federal Aviation Administration (FAA) for review under their type certification program.

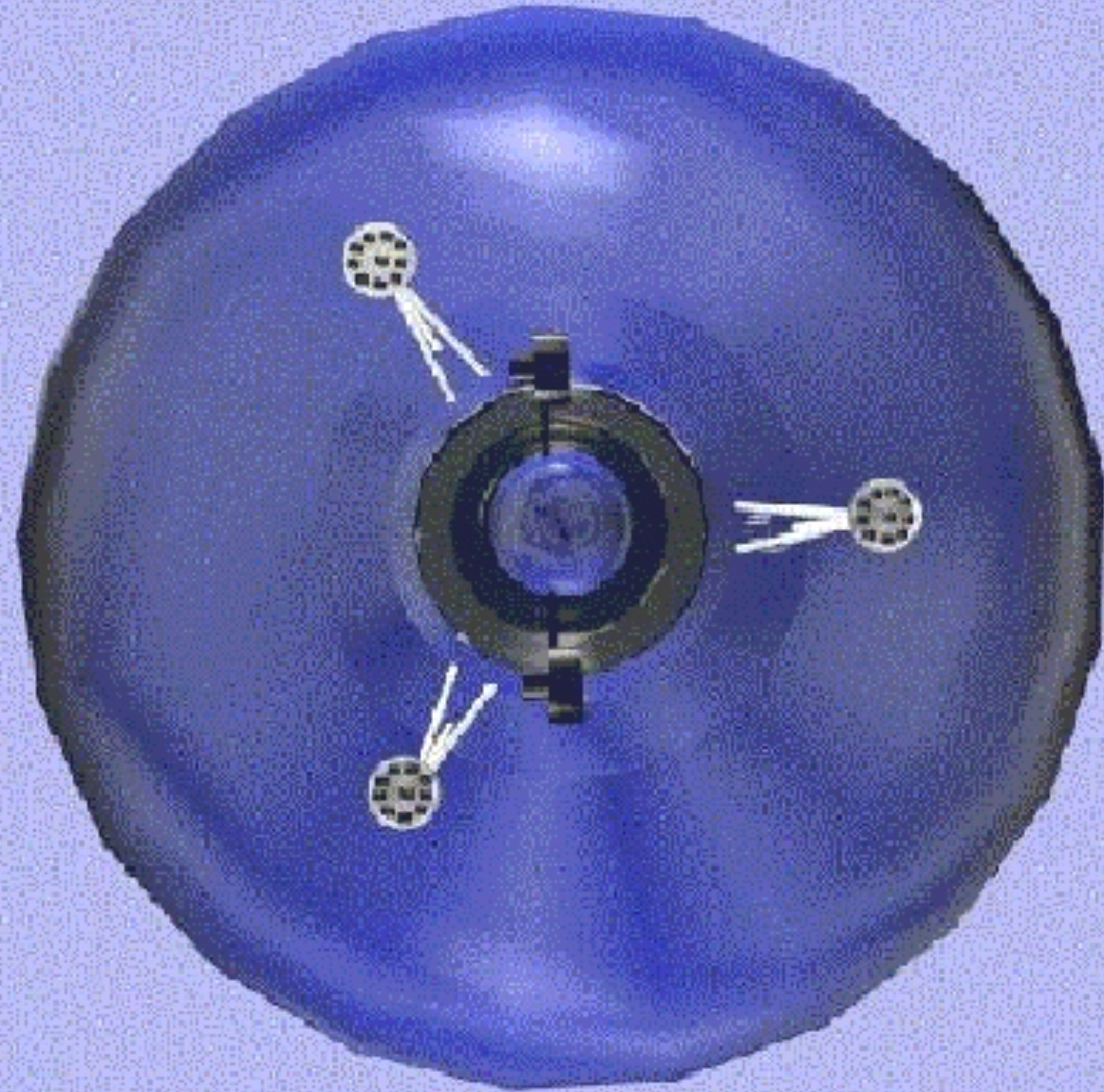
- Ideally, the systems demonstrator should be as small as possible while still demonstrating all of the aircraft's systems and production processes.
- Once the systems are certified, scaled units using these same systems can then be produced.
- The certification program takes an average of 18 to 24 months, congruent with the construction of the ship.

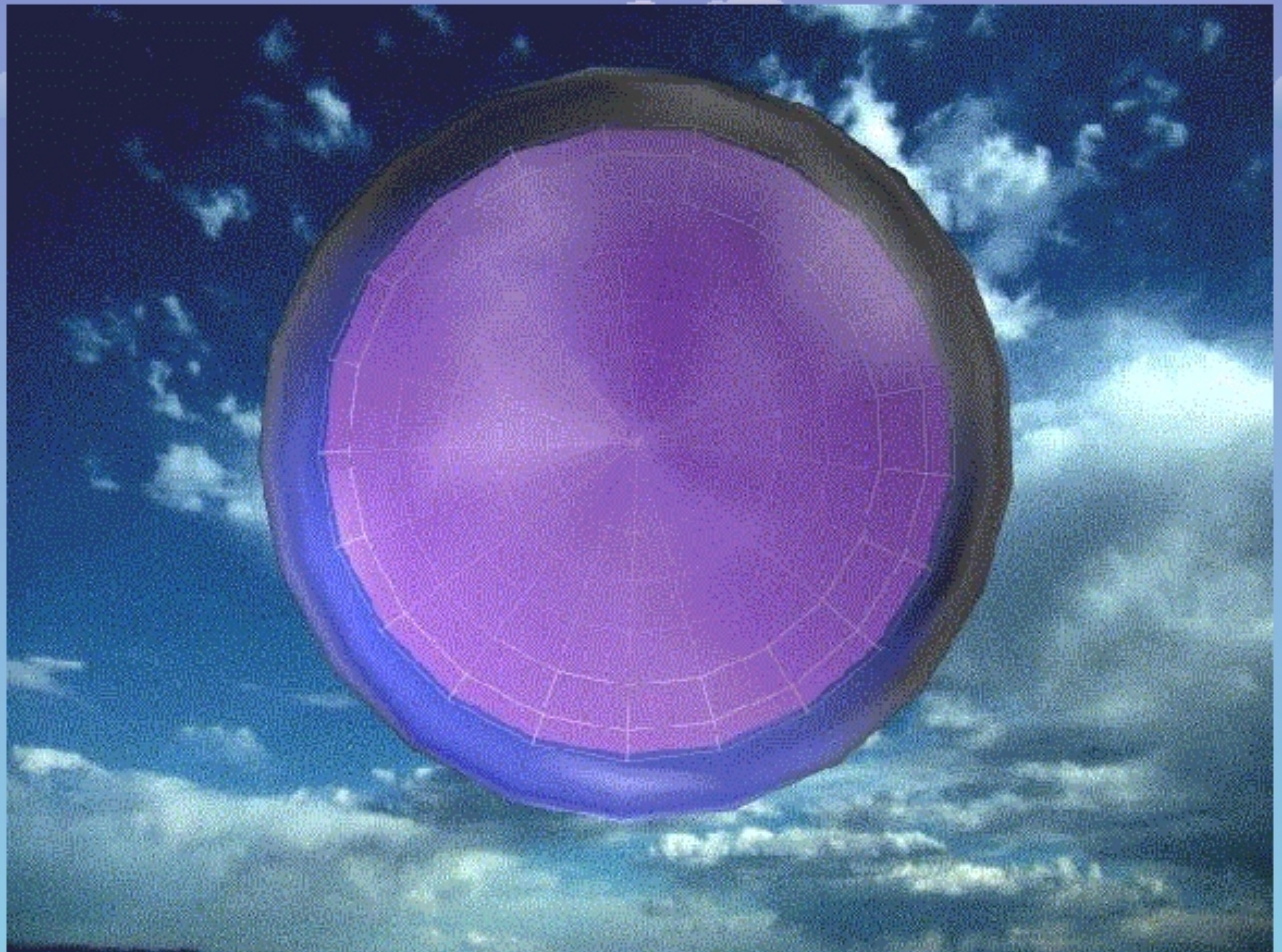


30-XB SYSTEMS CERTIFICATION DEMONSTRATOR

Airship specifications :
66 feet in diameter, 30 feet high, carrying 2 to 3
passengers or a similar weight in equipment.









TOURER - 90 ECOTOURISM CRAFT

BECAUSE OF THE UNIQUE AND PROPRIETARY
LTAS DESIGNS, THIS AIRSHIP CAN GO WHERE
OTHERS ARE NOT ALLOWED.

140 feet in diameter, 40 feet high. Carries 24 passengers.



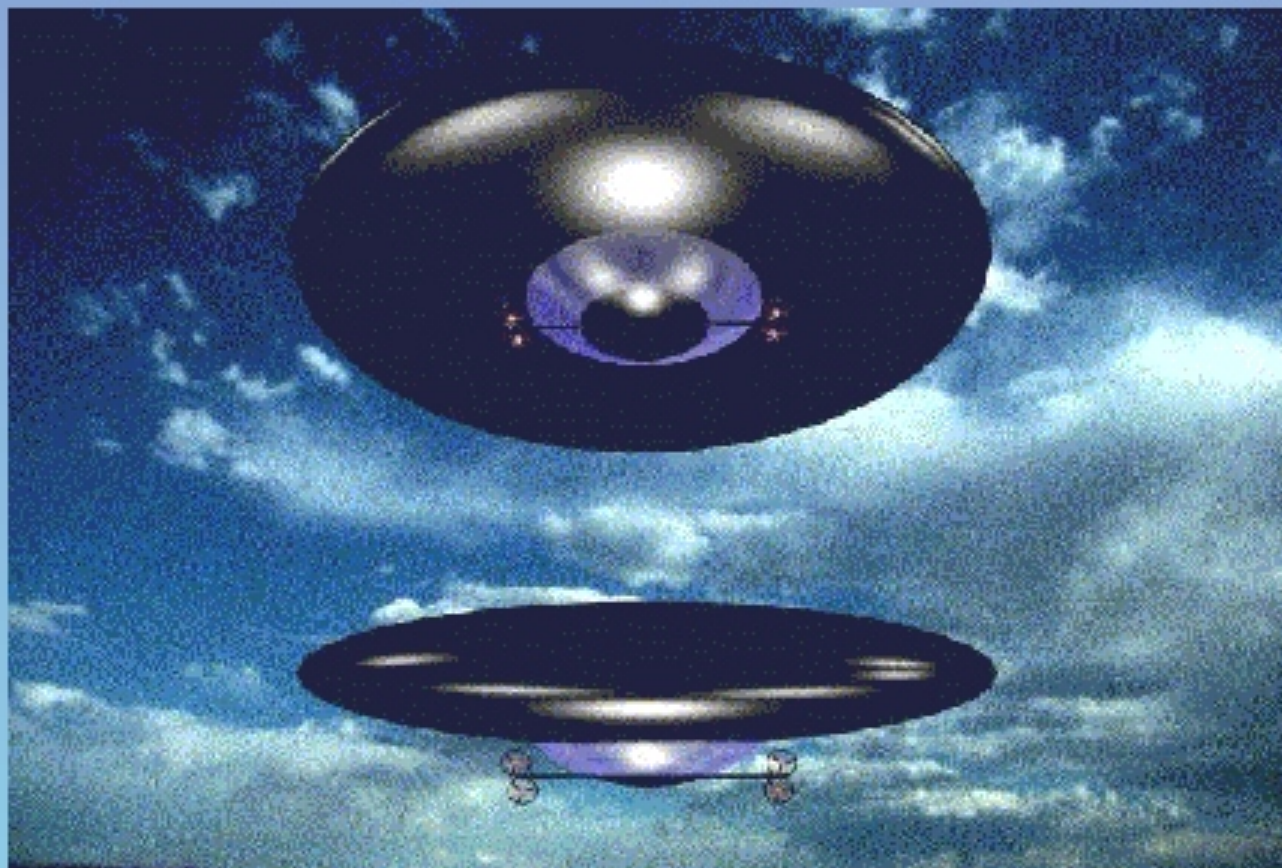
UNPARALLELED VIEWS, RANGE, QUIET...



T - 280

150 PASSENGER

MORE IS BETTER....



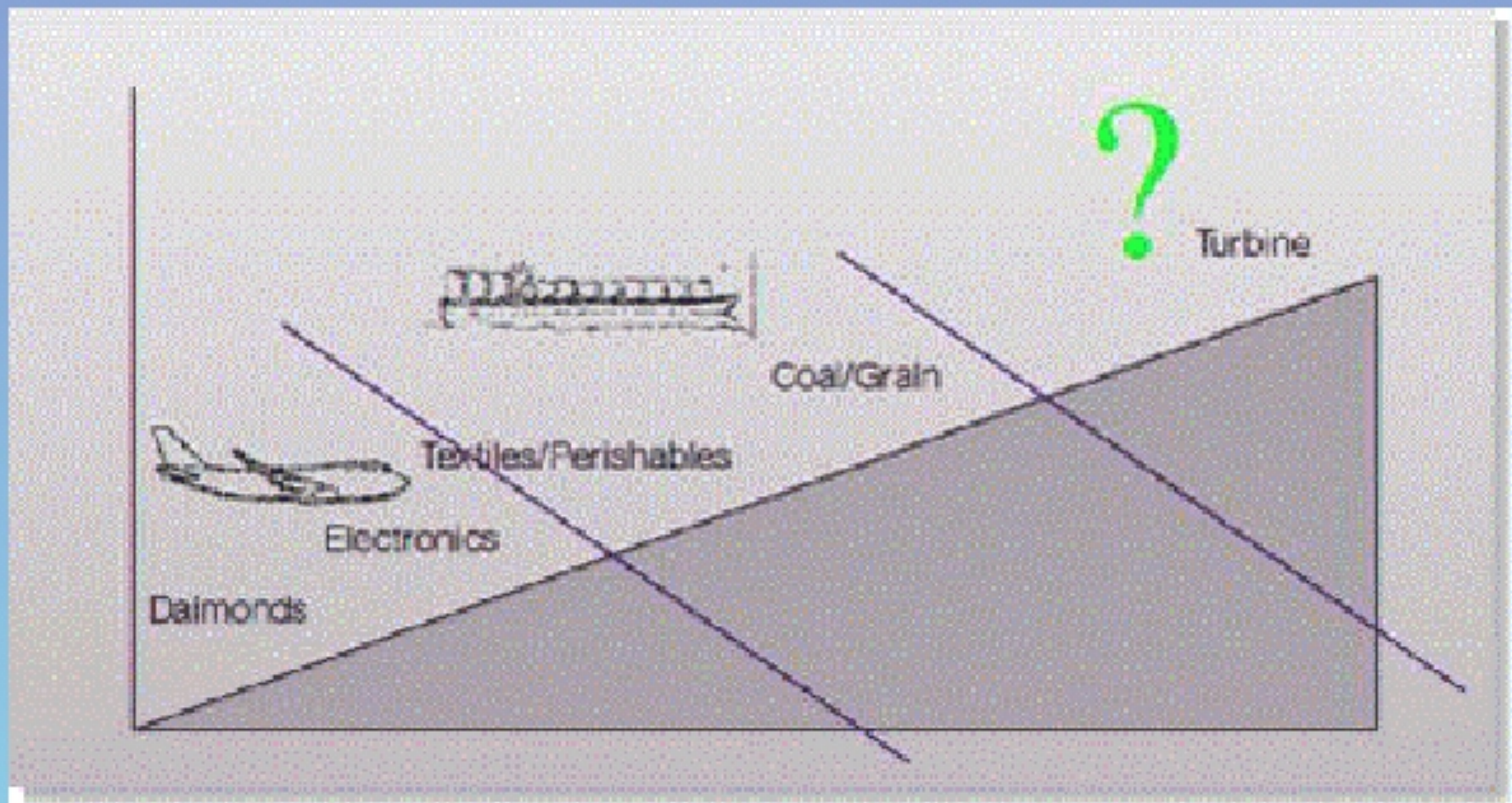
CARGO SHIPS

MORE, FASTER, CHEAPER.....

- Ability to carry large indivisible items...I.e. Turbines, compressors, truss structures.
- Payloads of 100 to 500 TONS !!
- Average speeds, with ONLY solar power as the motive force, of 45 MPH.
- Hybrid speeds of up to 100 MPH.
- Reduced fuel costs.
- Unlimited range.
- Unfilled market segment.

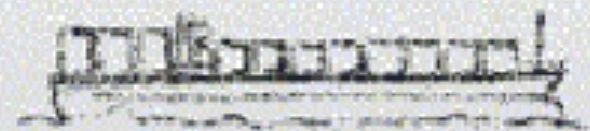
CARGO AIRSHIP MARKET

AN UNFILLED MARKET NICHE



CARGO AIRSHIP MARKETS

UNFILLED MARKET NICHE...



From Continent to Continent

In hours

..... days

..... weeks

Per Kilo

inx,yy US \$

...0,yy US \$

per container in ...xxx US \$

**Need: Fill the gap between the fast but expensive aircraft
and the cheaper but slower ship.**

CURRENT CARGO SHIPS

SCALING UP THE T-280.
MAKING IT FIT A STANDARD AIRSHIP HANGER





PASSENGER / CARGO COSTS WHY L.T.A.S. CAN DO IT AT LOWER COST.

What makes L.T.A.S. Corporation's Airships so DIFFERENT.

DENSITY CONTROLLED BUOYANCY(DCB)

**Eliminates mooring masts and ground crews
(80% OF AIRSHIP OPERATING COSTS!!!)**



DARE TO COMPARE??



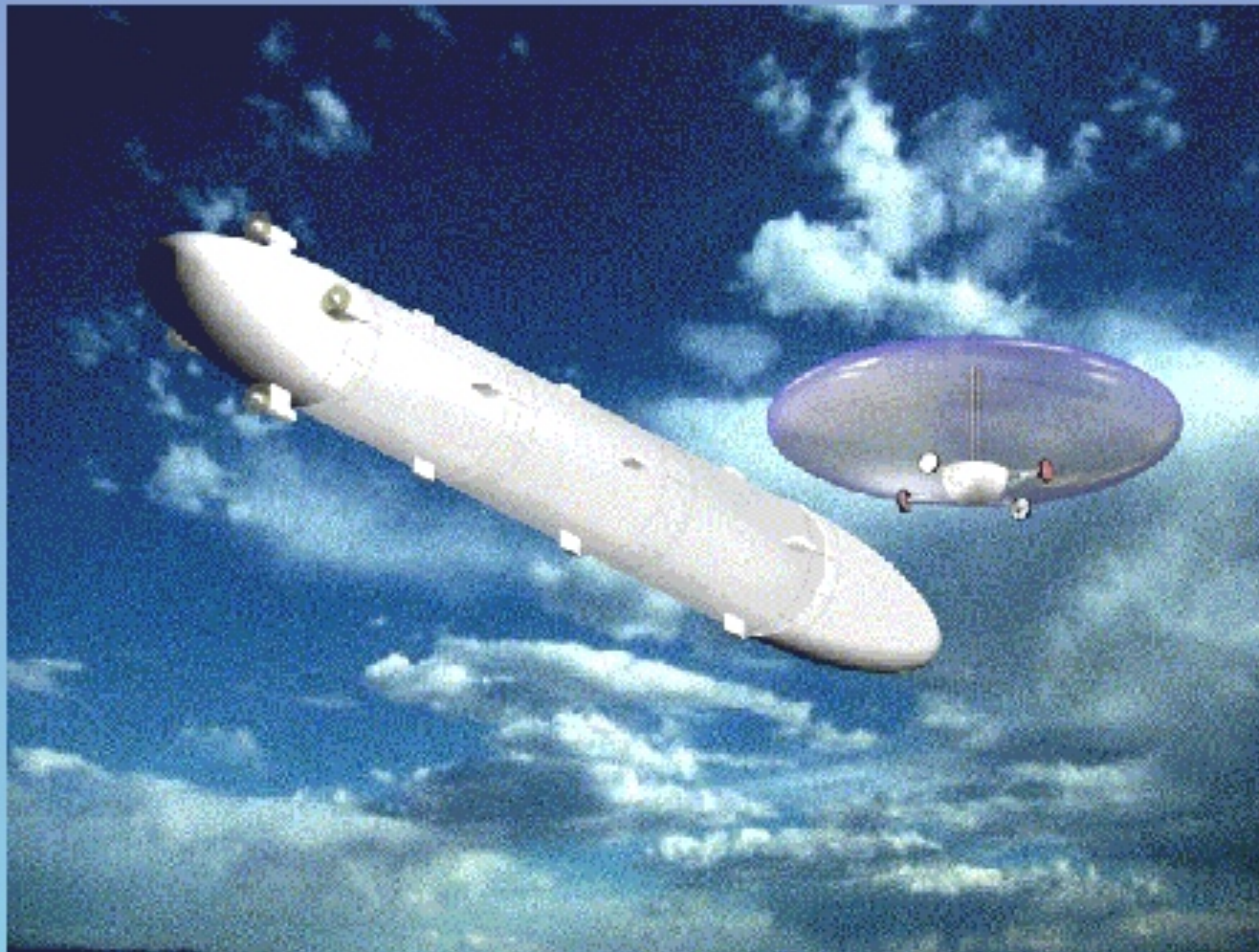
THE FUEL FACTOR

CONSTANT SHIP WEIGHT, CONSTANT PAYLOAD

- A fueled system and a solar electric system have equal weight at 2,500 miles range. (LA to NY)
- After that, the fueled system must stop and refuel, trade PAYLOAD for FUEL, or be made larger to carry additional fuel for longer range.
- For transpacific ranges, this results in a ship that is more than twice the size of a comparable L.T.A.S. ship which carries a like payload.

THE “FUEL FACTOR”

“FUELED”.....A MUCH LARGER-EXPENSIVE SHIP



SLOWLY UP THE HIGH ROAD

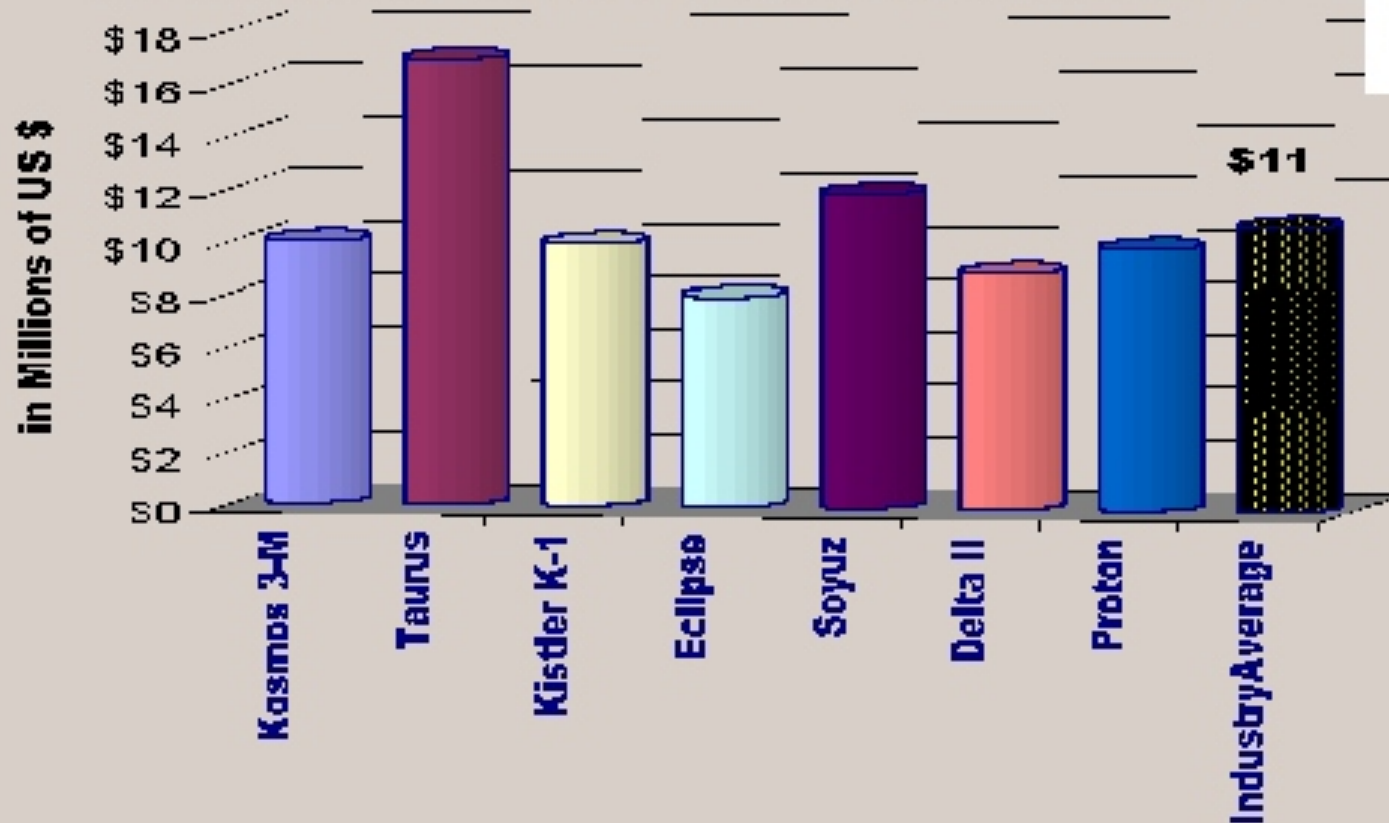
AIRSHIPS TO ORBIT....

- As extreme as the cost / benefit advantages of L.T.A.S. type airships are at low altitudes, when you look at them in comparison to other high altitude platforms, geostationary platforms and orbital launch systems you see the magnitude of the advantages.
- The size of ship required for high altitude missions is 2X to 3X that of a 100 ton cargo ship, with the additional, and proportional, SOLAR power needs that a ship of this size requires.

SLOWLY UP THE HIGH ROAD

ROCKET FUEL COSTS WAY MORE THAN GAS...

**Iridium/Globalstar Class Comsat
Announced launch price by company**



- Because of high orbital launch costs, a number of companies are planning high altitude communications platforms. These will provide low cost, high speed Internet hubs in the sky.
- The problem with heavier-than-air (Airplanes) and fueled LTA vehicles is that they have altitude limitations (typically 65,000 to 75,000 feet). They are constrained either by aerodynamics or by the lack of oxygen needed for fuel combustion.
- None of these concepts require the amount of solar cells nor do they have the performance capacity of the L.T.A.S. Sub Orbital Solar collector & Communications Station (SOSCS).

SLOWLY UP THE HIGH ROAD

FUELED, LOW ALTITUDE, SMALL LOW EARTH ORBITS.

WHERE IS THE SOLAR CELL MARKET IN THESE SYSTEMS? THERE ISN'T MUCH OF ONE.

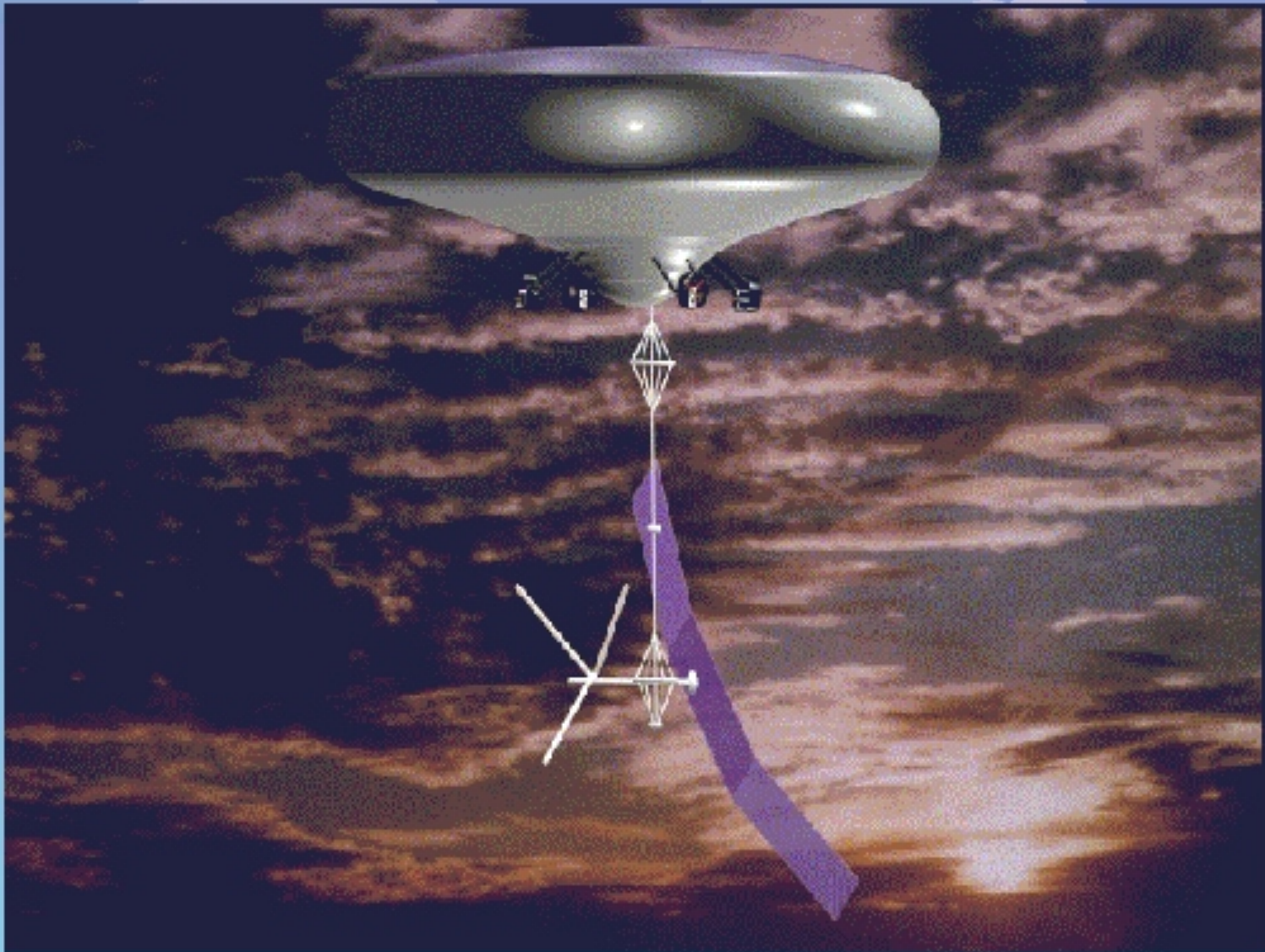


SLOWLY UP THE HIGH ROAD..

REAL HIGH ALTITUDE GEOSTATIONARY PLATFORM.

- As the ORIGINATOR of Geostationary Stratospheric Telecommunications Stations (GSTS), L.T.A.S. Corporation has, for over 20 years, had both the LTA expertise and propulsion system design for sustained flight at over 100,000 feet in altitude.
- Our station represents a well thought out, proprietary plan that will provide the solar industry with a market of 7 Mw to 10 MW per unit. We will deploy more than 250 SOSCS units in the full array.
- All of our products are SOLAR POWERED.

SLOWLY UP THE HIGH ROAD..



SLOWLY UP THE HIGH ROAD..

“THE SKY NO LONGER HAS LIMITS...”



THE LAST FEW QUESTIONS

GETTING TO THE BOTTOM LINE

- Are these things SAFE ? What about the Hindenburg ? Wasn't that a "Rigid airship" ?? Didn't they all CRASH ?
- This all sounds like a bit of science fiction. Can you really do this? Who IS L.T.A.S. ? How come I've never heard of you ?
- As part of the SOLAR / ELECTRONICS / TELECOMMUNICATIONS industries.... What's in it for me.... How does it help my bottom line?

ARE THEY SAFE ??

WHAT ABOUT THE HINDENBURG ??

- From the flight of the electrically powered LaFrance in the 1880's to the end of large airship travel in 1937, there were a total of almost 200 ships built. Of these, only 11 were destroyed in crashes (not directly related to WAR).
- Of the 11, 4 were hydrogen explosions....
(Modern ships will use nonflammable HELIUM)
- 4 had structural failures (1 due to non-repair of a known flaw and 1 due to political pressure to fly before testing was done.)

ARE THEY SAFE ??

(Modern airships would be made of composite materials, using computer aided design and stress analysis.... In airship design they are under MUCH less stress than in jet aircraft.)

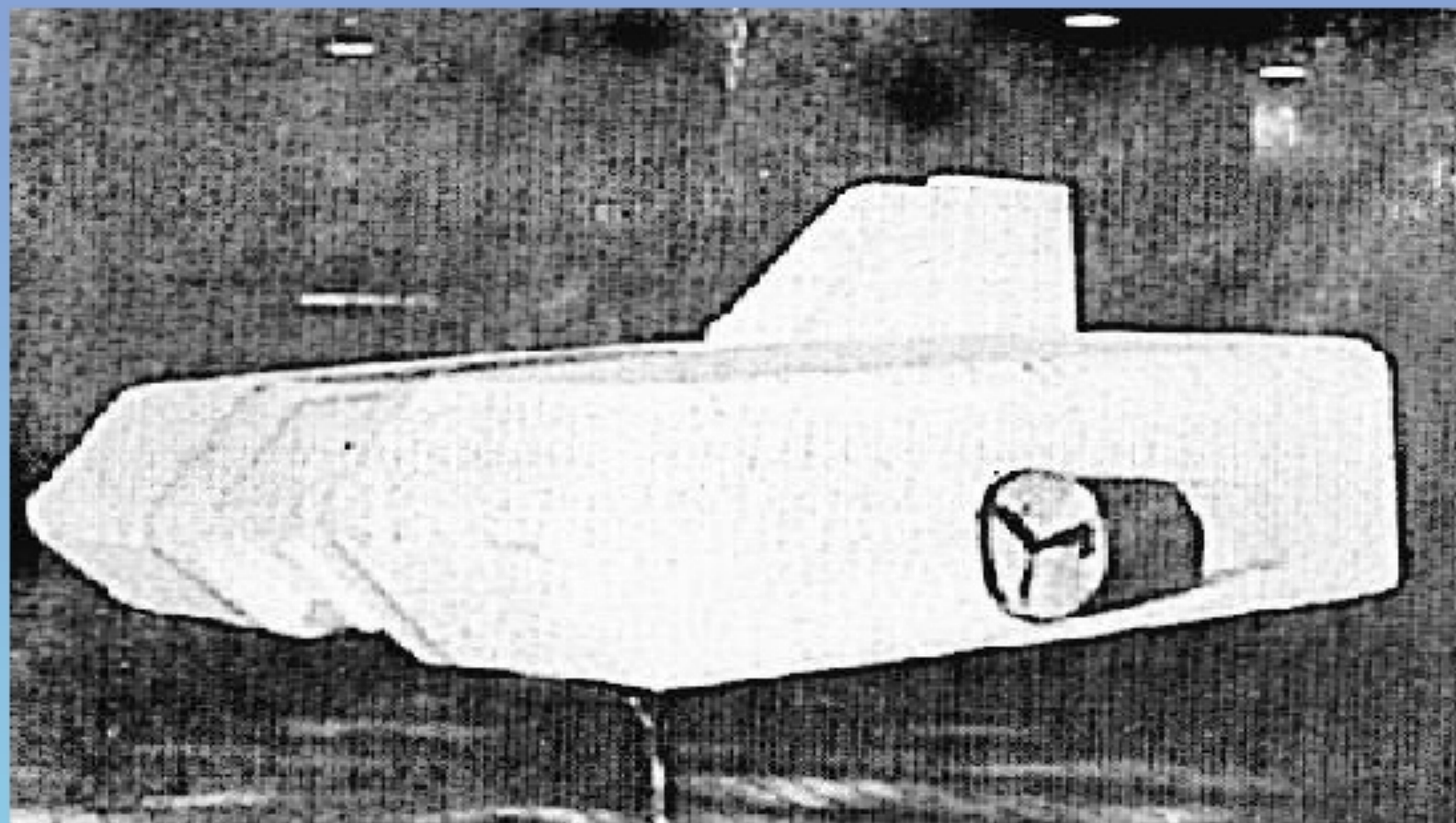
- 2 were lost in “Sudden Storm conditions”...*(Modern ships would have all of the instrumentation of a jetliner complete with access to GPS navigation and the world wide weather satellite information system.)*
- 1 was lost due to pilot error in “Arctic conditions”.
- In nearly 60 YEARS only 350 people were killed.

CAN YOU REALLY DO THIS ???

- Simple one word answer... YES.....
- We have a 30 YEAR history of DOING it not just TALKING about it.....
- We are historically recognized as flying one of the first “Functional solar powered aircraft” the XEM-1 in 1974 through 1977.
- One of the longest “unofficial” solar powered flights XEM-2 93 DAYS Feb to May 1978.
- Design of the first fully aerobatic airship RC model XEM-4 with SPACIAL of Mexico 1982.

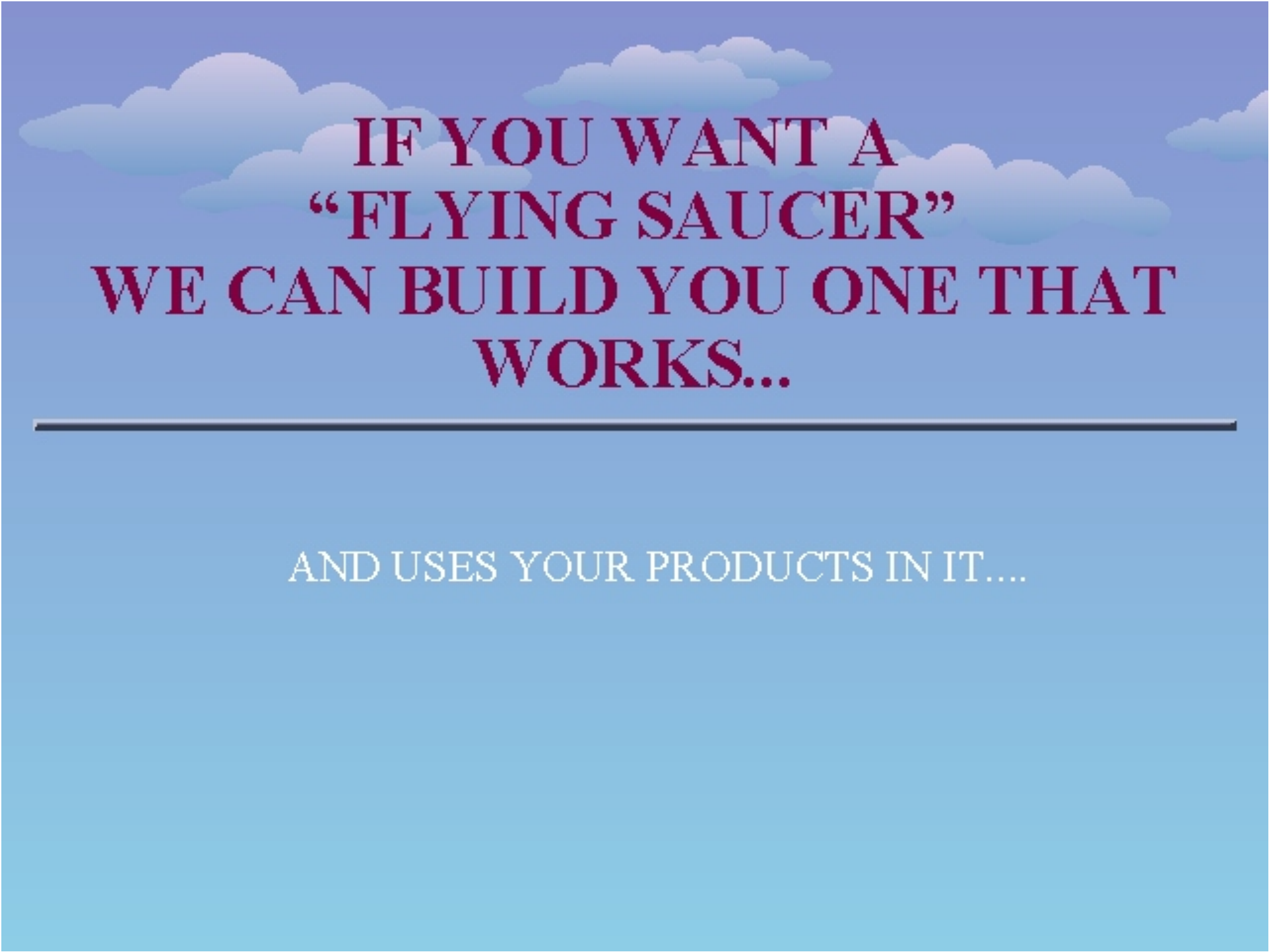
L.T.A.S. XEM-1

ONE OF THE FIRST SOLAR AIRCRAFT...



REAL..NOT JUST MODELS...

- Designed and built in cooperation with SPACIAL of Mexico..... MLA series of full scale manned rigid airships... MLA-24, MLA-32-A, MLA-32-B
- The MLA-32-B's maiden flight in June of 1989 was the first flight of a full scale manned rigid airship in over 50 years.... (Predating the Zeppelin NT by almost a decade !!)
- The Lenticular "Saucer" form is due to aerodynamic considerations...NOT a marketing hook.....



**IF YOU WANT A
“FLYING SAUCER”
WE CAN BUILD YOU ONE THAT
WORKS...**

AND USES YOUR PRODUCTS IN IT....

MLA-32-B

105 foot diameter, 40 feet high, 14 Passengers.
Maiden flight June 1989....





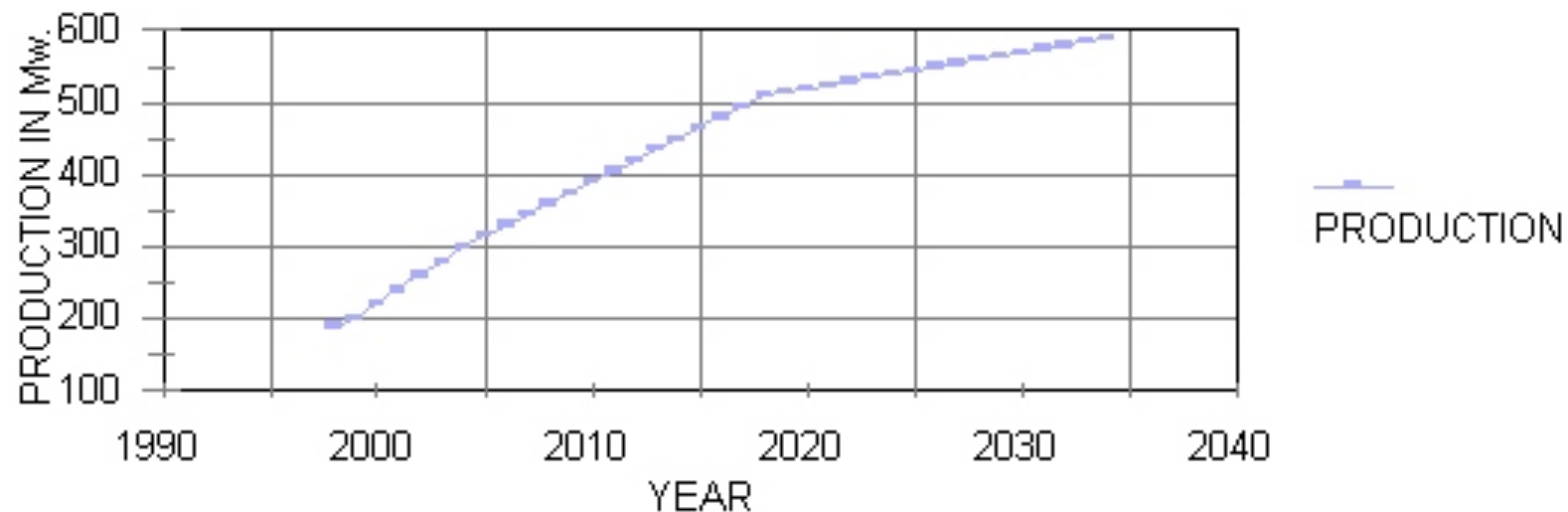
THE BOTTOM LINE

WHAT ALL THIS MEANS
TO THE SOLAR CELL INDUSTRY.

MARKET GROWTH

UTILITY PV GROUP report 1997

PREDICTED WORLD SOLAR PRODUCTION



THE BOTTOM LINE

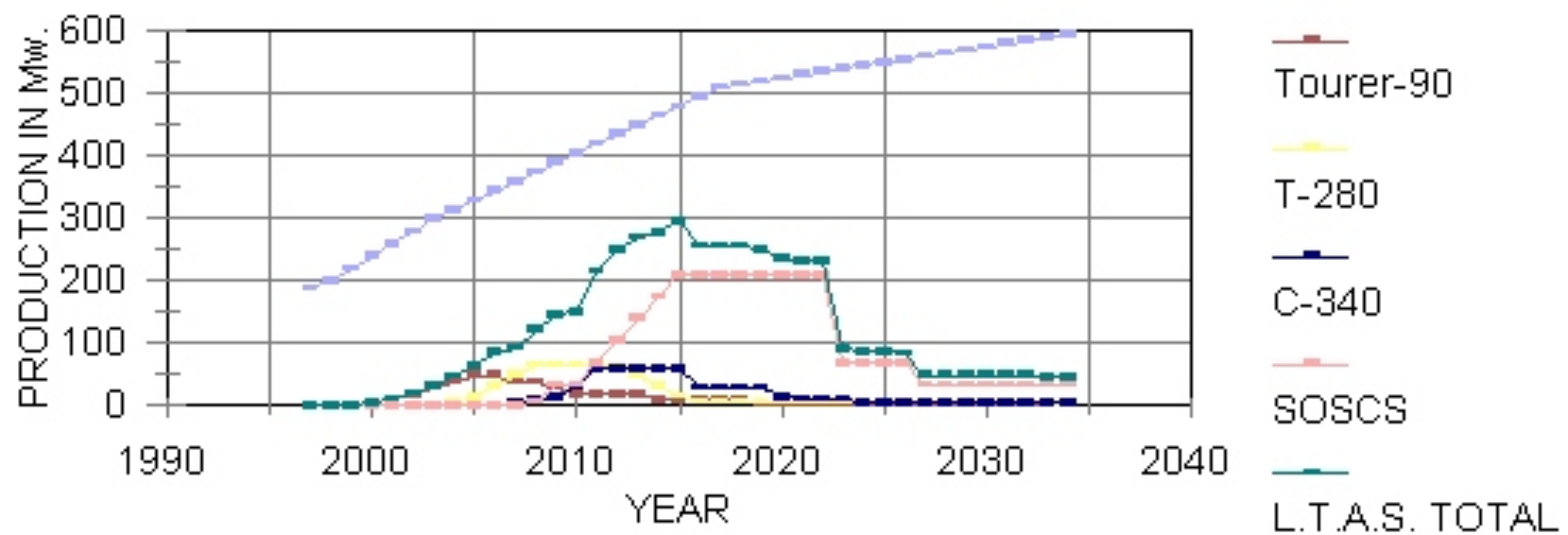
L.T.A.S. PRODUCTS EFFECT ON THE WORLD PV MARKET.

- Phased in production of scaled ship sizes allows for production capacity development.
- Time frames to high production rates are reduced by half as demand is accelerated.
- The overall world market for PV cells is almost doubled by the L.T.A.S. projects.
- L.T.A.S. concepts offer an immediate efficiency increase for your current products of up to 20%

THE BOTTOM LINE

L.T.A.S. PROJECTS REQUIREMENTS

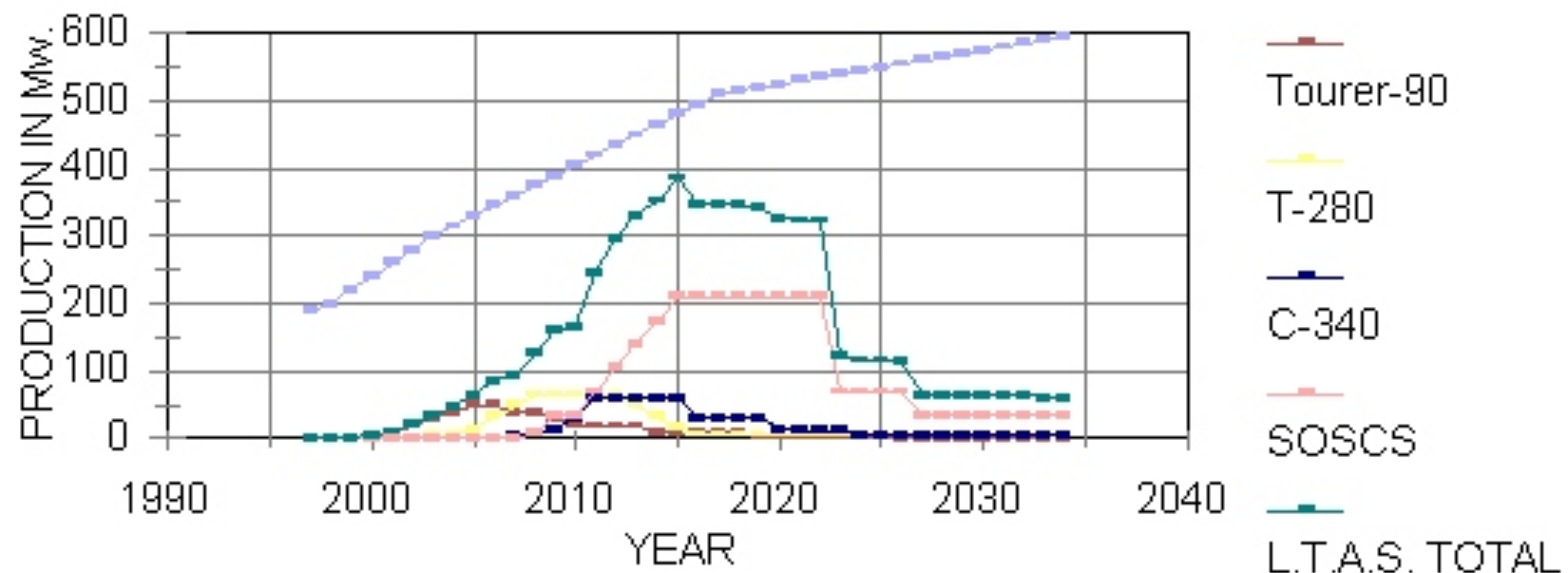
Shown with 7Mw. SOSCS Production



THE BOTTOM LINE

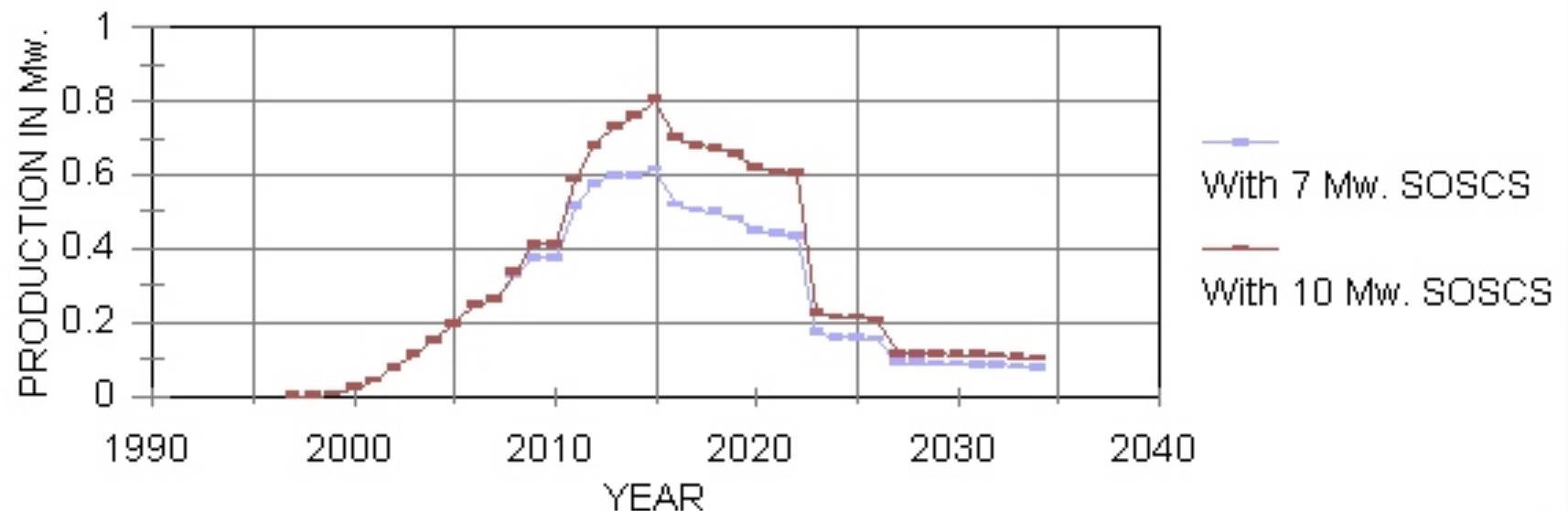
L.T.A.S. PROJECTS REQUIREMENTS

Shown with 10Mw. SOSCS Production



THE BOTTOM LINE

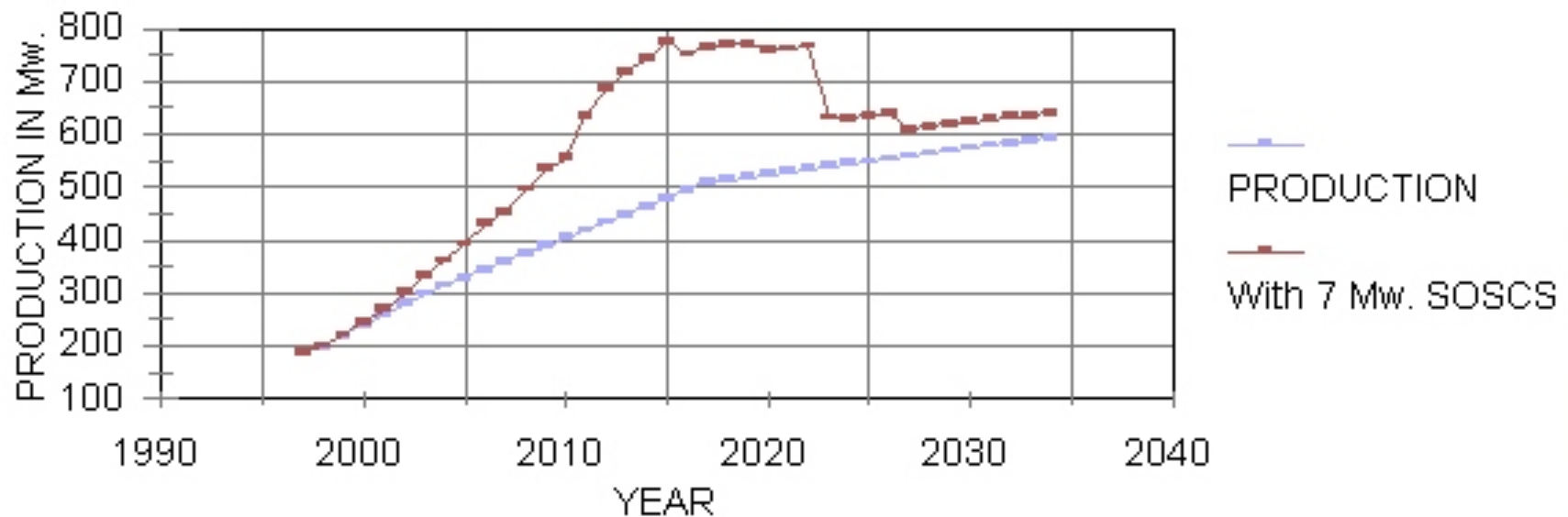
% OF L.T.A.S. PROJECTS PREDICTED WORLD SOLAR Production



THE BOTTOM LINE

WORLD SOLAR PRODUCTION

Shown with 7Mw. SOSCS Production



THE BOTTOM LINE

WORLD SOLAR PRODUCTION

Shown with 10Mw. SOSCS Production

