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100YSS – DARPA-RA-11-70

The New Star City – Intentional Community as a Vehicle for the Hundred Year Starship Program

Proposed by: The Living Universe Foundation – a 501c3 nonprofit corporation

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Projected Cost (full urban development program): tens of billions of dollars over several phases of urban and facility development. Potential supercentenarian development ceiling is unlimited.

Proposal Validity Period: 5 years

Note: The Living Universe Foundation is a 501c3 non-profit corporation whose current members are not, at present, providing any scientific, engineering, or technical assistance to DARPA or any related offices through any form of contract or sub-contract.

Vision:

A hundred years is a long time, and it gets longer every day. Just as we say that, thanks to communications technology and broadcast media, the world is shrinking and our perceptions becoming increasingly cosmopolitan, so too has technology brought a kind of relativistic dilation in time, the pace of cultural and technical change accelerating to where what was once considered short timeframes now seem increasingly large and we can only comfortably predict outcomes in progressively shorter time spans. It is as though we were passengers on a spacecraft approaching the speed of light, the universe around us seeming to continually speed up relative to our own perception of time. The potentially overwhelming psychological impact of this perception is the basis of what has come to be termed 'future shock', resulting in a progressive decline in the ability of society to collectively strategize on the future. The future has changed from something we anticipate and participate in to something that happens to us, as seemingly beyond our personal comprehension and control as the weather.

And yet many important things still do require great amounts of time to accomplish and an ability of society to collectively plan and act over such spans. The objective of deploying the first starship is one such task. The time and scale of such a project cannot be overestimated. Even for a presumably unmanned initial mission, we are looking at something which far surpasses Apollo in relative scale. The necessary technology is by no means at hand and would require many decades of research and development. Just the communications systems required to maintain a contact with such an interstellar spacecraft could represent the largest in-space structures ever built and would need to be maintained continuously over the span of a mission that, itself, may take decades to centuries depending on the possible propulsion technology. Such a program calls for a more persistent focus of resources and social commitment than anything our civilization has sought to accomplish in recent history, and today mustering such focus is tougher than ever.

Neither government agencies nor their presumed alternative corporations are currently capable of such coherence of purpose over such great spans of time as they have fallen victim to the same effects of accelerating change that challenges the general public's abilities to cope. With partisan extremism now the accepted norm in contemporary politics, government coherence may now be limited to the span of a single election cycle. Meanwhile corporations have become so volatile that it is unlikely more than a few of any scale in existence today will continue to exist or have the same owners and agendas within 20 years. The economies of whole nations now swing boom to bust at increasing rates of oscillation, dragging policy and business stratagem with it. How then do we, as a society, effectively pursue such large, complex, and very long-term tasks?

A lack of mainstream cultural relevance is the root problem with the contemporary decline in public and political support of space today, originally too dependent upon unsustainable nationalistic imperatives. To reverse that trend, given the contemporary social and economic climate, we must actively cultivate a new cultural relevance in a more contemporary context. It is our assertion that the key to accomplishing this is the encoding of the objectives of such long-term programs into the core culture of a specific society, and the logical means to that the employ of another kind of social institution which, though commonly overlooked, continues to

demonstrate its potential for long persistence; the intentional community. Thus we propose, as the core strategy for the 100YSS, the establishment and cultivation of a planned physical community for which the objectives of this space program are instilled as a common cultural imperative—a basis of collective cultural identity—while also serving as an economic engine in support of the program.

Put simply, we propose the creation of a new Star City, but one more akin to a Silicon Valley of space where space development and the goals of the Hundred Year Starship become the basis of a resident cultural identity in the way that music and the arts are the foundation of the cultural identity of the inhabitants of the city of Vienna. In effect, we seek to embody the pursuit of the Hundred Year Starship as a lifestyle physically embodied by a community that functions as both host to this program and incubator for a diversity of space industry which, in turn, economically and technically supports that program as a cooperative community venture.

Only with these objectives so deeply encoded into a society's *raison d'être* can their coherence persist across generations. This is, in fact, why supercentenarian companies of the past could exist, they and their industries or crafts becoming cultural heritages of specific towns, cities, and regions, as opposed to the contemporary multinational corporation which often exists like a homeless orphan demiurge devoid of cultural identity and social responsibility.

To paraphrase the late Carl Sagan, we envision this new Star City as a port city on the shore of the cosmic ocean, integrating into its overall architecture both the functions of a full living urban habitat and the space center facilities necessary for the pursuit of the Hundred Year Starship program along with a diversity of industries relating to that. In effect, we are cultivating the world's best location to do all things related to space, in a logistical, commercial, and cultural sense. The best place to pursue space as a business and a career. Reinforcing this would be a new urban architecture that aesthetically expresses the cultural aspirations of the community and an optimistic view of the future.

By default, this would be a micro-urban eco-community incorporating the latest in sustainable technology and design methodology. It's irresponsible today to propose any urban development that is not eco-development, but in this case we would seek an exemplary example, rivaling projects such as Masdar City, as a basic expression of the forward-thinking nature of the resident culture. Extensive use of renewable energy technology would not only improve the sustainability of the community but also support its necessary development for space applications. We anticipate this new Star City having the aspect of a large university campus set in a Japanese garden, largely free of automobiles, comfortable as a walking environment, balancing the beehive activity of its space center with the serenity of its residential areas and likely near/on ocean setting. Public gardens will be a particularly important aesthetic feature. Used extensively throughout the urban habitat, gardening is symbolic of the ultimate objective of space development—settlement—as the essential process of that is the cultivation of garden habitats for us to live in within its various challenging environments. We are not conquerers of space, rather gardeners of the cosmos. We go to space to bring life to it.

The Star City would integrate several key functions in a compact common location; residence (with the typical compliment of service facilities), recreation, cultural activities, resort, university, general commercial space, light industrial facilities, sea and air ports, and a space center. Though commercial in nature, these facilities would be operated as a municipal cooperative, essentially functioning as a shared resource of the resident inhabitants, companies, and industries in the city. Of necessity, this city would be located in a tropical latitude with an eastern or southern coastal location affording unobstructed prograde launch vectors. Given the increasing scarcity of such real estate in areas that can accommodate a western middle-class standard of living, we would explore the possibility of a fully marine-based option using existing marine construction technology—such a capability for constructing waterfront real estate on demand being a valuable industry in its own right.

How will such a community function as the economic engine of a space program? To answer this question we must consider the situation of commercial space today. Though some might argue this point, space industry is not truly commercially sustainable today because, to date, the industry has realized very few of its potential commercial applications. After half a century, communications satellites remain the only major space application proven definitively profitable—and in this age of Internet convergence are becoming obsolete given that latency issues make them a poor medium for Internet traffic. Satellites are not going away, of course, but they may no longer be a growth industry. Compared to most mundane industries the commercial space industry actually remains rather small, despite the apparent impact of space-based telecommunications in the past. The annual market for soft drinks is twice the size of the annual global commercial market for space. The cost of building the ISS was more than the total annual space market. Thus there has never been a situation where Capital has eagerly lined up for a piece of the action in space. Without what is essentially a routine public subsidy through military and national space agency contracts, commercial space might not exist.

Why has commercial space been unable to get its act together for so long? Many jump to the conclusion that there has been some sort of bureaucratic suppression by government. You often hear suggestions that government needs to “get out of the way” of commercial space development. In some few situations this may have been a problem, but in this author's opinion the root of the problem has not been a suppression of commercial space by government but rather an unhealthy dependence upon it to define applications and cross-industry integration the commercial space community itself has chronically failed to cultivate independently and systemically.

Commercial space has failed to cultivate the sort of alternately 'horizontally' competitive and 'vertically' cooperative industrial ecology that has been key to rapid development in industries like computers and digital communications. It has realized no organized means of its own to systematically seek out, cooperate on, and develop new applications and shared systems architectures, and therefore realize new markets. That role has too long been relegated to government, which compelled companies to work together through its bureaucracy to integrate on its applications—ones which have generally had little commercial value. Now government is backing away from that role, leaving a vacuum the industry has still shown no signs of actively

filling by other means. One must ask, why is the 100YSS the brainchild of DARPA and not a commercial consortium—of New Space companies especially?

The reasons for this situation are many. The technologies used in space do not, of themselves, have an inherent order to them in the way computer technology has, aided by electronics' development of a specific common modular visual language of engineering which weighted a natural order of sub-system development. There are no common systems architectures for space systems and few standard systems components and thus no common applications development paradigms built on vertical integration. And there have emerged no equivalents at CEO level, even in the New Space community, of futurist entrepreneurial visionaries akin to those who started the personal computing revolution—people with a very coherent long-term vision of what space development should ultimately accomplish. Space advocacy's visionaries don't usually get to be aerospace industry executives.

Perhaps the root of all of these issues is a simple lack of proximity and social interaction. The priorities of Cold War security and pork-barrel politics has left the aerospace industry very physically dispersed and divided among too few too large corporations competing for government's patronage. There is no Silicon Valley of space fostering concentrations of entrepreneurship in which a coherent culture of space application development might form. This is what our proposed Star City would realize, using an intentional community to function akin to a 'meta-corporation' for the shared interests of a community of entrepreneurial businesses and with the 100YSS providing a catalyst of cross-industry cooperation on shared architectures and common development objectives. In this kind of climate a more systematic cross-industry approach to application development and finance can evolve.

To facilitate this role as a catalyst of a space industrial ecology the Star City would incorporate two key institutions; a Community Investment Corporation as the essential financial architecture on which the community is built and a system for program and project cooperatives coalescing around the objectives of the 100YSS as a shared focus of development.

The CIC is a concept originating in the economic theories of Louis Kelso, who invented the Employee Stock Ownership Program. (ESOP) To put it very simply, a CIC functions like a condominium corporation expanded to the scale of a whole community. It owns and manages the development of all the real estate in the community and is in turn owned by all the residents of that community, sharing in its growth of value as the fruit of their collective productivity. When one moves to the Star City as a resident or business one is not buying property but rather shares in its CIC which equate to an option on the use a certain amount of space.

The CIC would not, of course, pursue only residential development. It would develop and use its space for many commercial applications, directing this income to its maintenance, improvement, dividends, and community cultural pursuits—the 100YSS program chief among these. We intend to expand on this to include strategic co-investment in a community of resident companies forming an industrial cooperative around the pursuit of the 100YSS. In effect, we are cultivating the city and its shared real estate as a sort of urban Linux 'platform' for a cooperative resident

community of space developers. With this a systematic approach to diverse application development can be pursued and through that commercial growth the city and its business community can realize the capital and resources to continually pursue the 100YSS program.

As for the 100YSS mission itself, we envision a relatively straightforward four stage program;

-Deep Space Exploration by 'Starglider' probes: Modest spacecraft relying on a long succession of solar and planetary slingshot maneuvers to achieve high velocities upon exiting the solar system. Though deployed toward neighboring target stars, these vessels would not, initially, be intended to survive to reach their stellar destinations. Rather, their purpose would be to develop and test very-long-duty systems, interstellar communications, and explore the characteristics of the interstellar medium as an aid to the design and development of later spacecraft. Such missions may be developed relatively soon after establishment of the Star City.

-Stellar Fly-By Exploration: These minimalistic unmanned vessels would represent the first true starships deployed by the program. They would be intended to perform fly-by remote observation missions while testing advanced propulsion technology. Expected to be deployed within a 50 year time frame from the creation of the Star City, we anticipate a likely realization of early forms of fusion or anti-matter based propulsion. Configurations like the Powell - Pellegrino Valkyrie concept may be likely. By this stage spacecraft construction would be a predominately on-orbit affair relying on extensive use of tele-robotic logistics facilities also supporting extensive development of a commercial orbital industrial infrastructure. A large interstellar communications system would be co-developed, ultimately taking the form of constellations of solar-orbital communications arrays designed to maintain continuous field of view coverage of destination stars.

-Robotic Exploration and Pre-Settlement: In this stage more advanced versions of the fly-by spacecraft would be used to deploy robotic systems for the intensive exploration of destination stars and, ultimately, pre-establish the infrastructures necessary to support manned exploration and settlement. We anticipate such missions toward the end of the century and expect by this time to see significant use of nanotechnology and artificial intelligence in the mission systems designs. Later vessels with more advanced systems may be deployed as Von Neumann probes.

-Manned Exploration and Settlement: The ultimate objective of the 100YSS and coming likely at the very end of this century or well into the next. A number of possible mission scenarios are possible in this stage, depending on the knowledge gained by earlier missions and the as yet speculative nature and social impact of future technology. The very advanced vessels of this stage, capable of velocities at large fractions of C , would likely rely on advanced nanotechnology to both facilitate their creation as well as to provide the tools for establishing a new branch of civilization in their destination stars.

With a whole city—itsself a global nexus of space industry, science, and development—it's resident society, and their collective culture functioning in unison, we will have a vastly powerful and sustainable engine with which to drive the pursuit of the stars for many centuries to come.

Ownership:

The ownership structure we propose for the 100YSS is keyed to the model of the Community Investment Corporation that would be the core financial structure of the Star City and its theory of progressively expanding community ownership. We would initiate the 100YSS program with the creation of this Star City CIC, its founding consortium members also optionally founding members of that program consortium. This would be started with the legal formation of the CIC and purchase of its initial property—or the facilities to manufacture it. The initial function of the Living Universe Foundation in this would be the design, cultivation and evangelism of the Star City and 100YSS concepts in order to assemble this founding consortium.

The CIC essentially functions as a real estate development corporation pursuing the development of the property that makes up the city and its facilities as a for-profit commercial venture, relying largely on the lease income produced by commercial uses of space designed for that purpose. (if relying on marine structures, also the industrial production and application development of waterfront real estate for sale and lease elsewhere) At the same time it uses this income to reinvest in the maintenance and further development of the city, its many facilities, venture investment in new businesses founded in the community, and the 100YSS program. (and ultimately additional space development projects) The CIC would also host a series of secondary divisions that provide various services to the residents, including credit union, financial services, mutual funds, insurance (which may ultimately expand to supporting launch services), health care, education, security, and so on.

In turn, the CIC is itself owned by all the permanent residents of the community and the co-invested members of the founding consortium. When a person moves to the Star City they acquire space for a home by buying stock in the CIC which equates to the right to use a certain amount of space relative to availability. (based on the type of architecture used, most residence space may take the form of various 'residential loft' spaces, pre-finished or unfinished, in volumes ranging from apartments to large homes) In some cases such stock may be purchased by loan (which can potentially be self-liquidating based on its dividends and thus used as a growth incentive), or purchased by a company on behalf of its resident employees to provide living space as part of an employment incentive package. (the company might hold this stock for its employee across the term of employment which the employee 'buys out' on his own, might offer it as a loan to the employee, or gift it to the employee outright as an incentive for key individuals) Businesses would either lease space conventionally or likewise buy into the community by buying stock or, if already a public company, trade their own stock for CIC stock in order to co-invest. Companies in the founding consortium would be similarly co-invested in the CIC when creating it.

Stock in the CIC would generate dividends deriving from its commercial activity which would be divided between resident stockholders, the city maintenance (defraying resident's maintenance fees and eventually including healthcare, education, and other costs), city expansion, and the city's official development programs and projects. (100YSS and later others) In practice the CIC may offer several kinds of stock with different owner-rights limitations; founder stock, resident

stock, public stock for trade outside the community, community industrial cooperative mutual fund stock, and so on. With this resident stockholder model the city has the freedom to repurpose its specific real estate as needed while not presenting any risk to the wealth invested by individuals in property from these changes. Property value is not dependent on the situation of specific locations or what an individual does with it but, instead, is keyed to the CIC and the city as a whole. As stockholders, residents share in the growth of the city and all its co-invested businesses, thus enjoying the same benefits to long-term investment as conventional property ownership. They have a vested interest in the city and all it does as well as owners rights in determining the disposition of that. Additionally, terms of CIC venture investment may include requirements for resident Employee and Consumer Stock Ownership Programs (ESOP and CSOP) further deepening the mutualist co-investment in the community.

To pursue specific development activities, the CIC would orchestrate programs and projects based on the creation of business/industrial/academic consortiums or cooperatives intended to improve the community or pursue its cultural (space in particular) objectives. These may take the form of non-profit corporations in the manner of industry consortiums employed in the computer and communications industries to develop shared platforms and standards. One such consortium would be established around the 100YSS program, which would establish an administration team for its pursuit from among its participating members. The 100YSS would produce little to nothing in terms of direct profit in a conventional commercial sense. This is the nature of many of the tasks of space development. Members of the consortium would seek their profit not in these projects but in the commercial activity they conduct through the city, its facilities, and elsewhere. They would, however, share in the technological dividends and benefits produced by the program and in the commercial exploitation of new facilities and capabilities they produce.

In effect, we treat these space programs and projects as mutual development platforms akin to Linux. Linux, as an open source project, doesn't generate profit on its own. Instead, it creates a shared platform with shared interoperability standards as a mutual resource for the cultivation of discrete commercial applications. It defines architectures facilitating vertical integration. This is a critical concept for space development that has largely been overlooked for half a century—largely because most people in the space industry do not comprehend that, fundamentally, space development is real estate development and, like computers, the value of their technology rests chiefly in its interoperability. Space development depends on the coordinated creation of persistent mutual resources. It's been assumed that was what government was doing by its space involvement—and it wasn't. Government never got that memo. Governments have not understood space as a 'place' for which it ought to be pursuing infrastructure development in the manner of highway development as a mean to national economic growth through the cultivation of new business. They have too long been caught up in this idea of space as merely a game of nationalist geopolitical prestige.

Through such dynamic project-oriented organizations catalyzed by programs like the 100YSS and concentrated in a common physical location the companies that, whole or in part, call the Star City home would be able to systematically pursue new space applications and an expansion of the economic potential of space long unexplored. This, in turn, would accelerate the ability of

the Star City to pursue and expand its projects leading to a continual growth in both terrestrial and space infrastructures, enabling ever-more sophisticated and larger scale development.

Another function of such business cooperatives would be entrepreneurial business incubators intended to cultivate new and relevant businesses within the Star City and from among its resident society. In partnership with the members of its founding consortium, the CIC would provide venture capital investment and incentive such as discounted facilities space and access for the creation of new businesses. Many of these businesses would be intended to support domestic needs and services; local small businesses like restaurants, cafes, non-critical healthcare, and local food and MOD (manufacture on demand) goods production. Others would be intended to expand revenue for the community; resort, hotel, and tourism, export production, the manufacture of waterfront/marine real estate. And still others would be focused on the core space industries of the community, filling in the gaps in the ecologies of certain based ventures such as space hotels and space-based manufacturing.

Similar consortiums/cooperatives may be formed for many purposes within the city, particularly the establishment of agricultural, industrial, and resource independence to improve both the environmental sustainability of the city and the quality of life for its inhabitants. A key founding premise of the Star City would be the important relationship between productivity and quality of life. And so a key imperative of its urban development would be to seek to maximize the aesthetic quality of the habitat while minimizing the hassles and incidental costs of living. Key to that is the pursuit of localization and diversification of production for domestic needs, which is also important in the context of space development as space settlement has largely the same goals of self-sufficiency. In many ways the Star City on Earth would be a research model for cities eventually created in space.

Through the CIC, its consortiums/cooperatives, and its progressive co-investment the Star City would evolve into a tightly woven yet rapidly growing network of economic mutualism focused on the pursuit of its cultural objectives in space and the continual improvement of standard of living and quality of life for its inhabitant, thus establishing a system with the potential to sustain the 100YSS program and other venues of space development for centuries. We would create through the Star City a kind of non-government international space development institution developing space for the mutual benefit of the entire world and an ever-expanding sphere of co-investors.

Management & Organizational Structure:

Initial management of the 100YSS program and Star City project would be under the non-profit Living Universe Foundation who's primary objective would be the crafting of a comprehensive business plan and the cultivation of a media presentation package with which to evangelize the Star City program. With these it would solicit the creation of a founding consortium, the commissioning of an architectural master plan, and the establishment of the Star City Community Investment Corporation as core financial structure. With the establishment of the CIC, management of the Star City project would shift primarily to it with the LUF maintaining its non-profit space advocacy and evangelistic roles.

The CIC would be initially formed as a consortium of several companies with an intent to locate facilities in the Star City, possibly one or more universities also interested in establishing a presence there (as opposed to this being created by the city later), and an investment group formed for the specific purpose of retaining property for the creation of the Star City complex over several phases of urban and space-center development. This founding consortium would have a basic goal of creating this physical community then diffusing ownership into its resident population. The 100YSS program initially would become embodied as a program consortium of the Star City's initial resident community and other companies and participants from elsewhere. This 100YSS program consortium would, technically, be separate from the CIC, to which it relates as a supporting partner and economic sponsor. The CIC would be, of necessity, a for-profit corporation with a number of divisions dedicated to various aspect of development, maintenance, and services;

- Domestic Development: the development of the Star City's local property and facilities, pursued for profit, as shared facilities for the initial commercial/industrial activity, and for support of the domestic needs of a resident employee population and families.

- External Development: the development of properties not within the Star City. Pursued mostly as supplemental for-profit development but may also include some supporting facilities for the city's own facilities, such as down-range telemetry and communications installations, specialized transportation facilities, and so on.

- Domestic Services: charged with the task of cultivating the variety of supporting services and small businesses which support the standard of living and quality of life for residents. This would include health care, pre-adult education facilities, and security—where not already supported by regional municipalities. We anticipate the possibility that the Star City may, because of its logistics requirements and subsequent location, be partly or wholly independent of, or physically remote to, any existing municipalities and thus need to provide those typical services itself.

- Utilities and Maintenance: manages the utilities facilities and physical maintenance of the city and its public facilities.

-Land Bank: manages the disposition of city real estate designated for use by shareholders as residence and business space.

-Finance Management: concerned with the large scale financial management of the CIC and the creation and administration of supporting instruments such as mutual funds, investment pool, insurance pools.

-Domestic Financial Services: establishes common financial, insurance, and banking services at the personal/small business level, possibly with the creation of a community credit union.

-Ventures: venture capital investment services in support of new businesses within the community and, optionally, externally.

-Project Finance and Support: administers CIC's contributions of funds and resources to program/project cooperatives/consortiums as well as providing communications and logistics assistance to aid their formation and organization.

-Visioneering: a futurist advisory division intended to cultivate and maintain the cultural objectives of the community, its supporting aesthetics in the city habitat, cultivate and maintain the vision of future development, and to catalyze or initiate key consortium/cooperatives. This division is the 'keeper of the dream' of the 100YSS program and its objectives as well as the general future development goals of the city.

These divisions, would each operate with their own executive management team under the management of an operational Executive Board composed of the CEOs of the individual divisions as determined by a Board of Founders and a Shareholders' Congress. The Board of Founders would be the initial or 'start-up' board of directors formed initially by the consortium with which the Star City project is founded, some of which may be founding investors. It would be intended to pass management to the CIC's Executive Board and, progressively, be absorbed into the Congress of Shareholders as community ownership is diffused.

The Congress of Shareholders represents a new concept in the relationship between shareholders and corporation that reflects the fact that the CIC is not simply a company but the core architecture of a living physical community. All resident stockholders are members of the congress which functions as a mechanism of direct democracy for establishing the composition and priorities of the Executive Board. We are now in the 21st Century. Models of shareholder relations based on seasonal cycles of limited interaction with limited feedback are anachronistic and, in the context of a community, voting rights based on share volumes inappropriate. Because the CIC represents the institutional basis of a physical community that its shareholders don't just own but call their home, a means for their direct participation in the CIC's agenda is ethically mandatory.

And so the Congress of Shareholders would be crafted as a continually operating facility relying

on Internet communications where the CIC's news and metrics of activity are continuously communicated to the community, opinion poles continually run, shareholder feedback continually gathered, shareholder propositions/positions asserted to board-level priority, and positions on the Executive Board annually reviewed. All shareholder residents of the community would have the freedom, through this on-line congress, to question the Executive Board and draft proposed positions or policy that rise to the board's agenda according to the direct support of the body of shareholders—in much the same way articles are 'upvoted' and 'downvoted' in an on-line news aggregator site. A policy of one-owner-one-vote would prevent ownership hegemonies, which is possible given that, technically, the CIC stock would not be publicly traded stock and free to employ its own rules. This eliminates the need for the community to establish a municipal government in the traditional sense, which might be considered conflicting with existing regional governments or municipalities, while maintaining a very high degree of direct community influence over the development of the city as an expression of ownership rights.

Aside from supporting the city itself and the standard of living of its inhabitants, the key economic objective of the CIC is to cultivate such revenue as to invest in key facilities as resources supporting its space-based aspirations—the space center in particular—as well as provide money and resources to key programs and projects—the 100YSS in particular. These would be administered by a series of consortiums or cooperatives. The difference between these two forms is subtle but would generally fall along the lines of consortiums being organizations including companies, institutions, and governments from outside the Star City community while cooperatives would generally be associated with organizations of participants exclusively from within the community. In practice, though, this distinction may prove blurry. These organizations would be voluntarily formed around either very specific projects with specific end-goals in a specific time frame or protracted programs composed of numerous discrete projects or a more generalized activity pursued perpetually.

Examples of perpetual programs would include the city's university, a science and engineering research program, a city arts and culture program, a business incubator program, and so on.

Examples of protracted but specific programs would be the 100YSS and other likely related space programs such as Lunar, Mars, orbital settlement, planetary research and exploration, and similar initiatives.

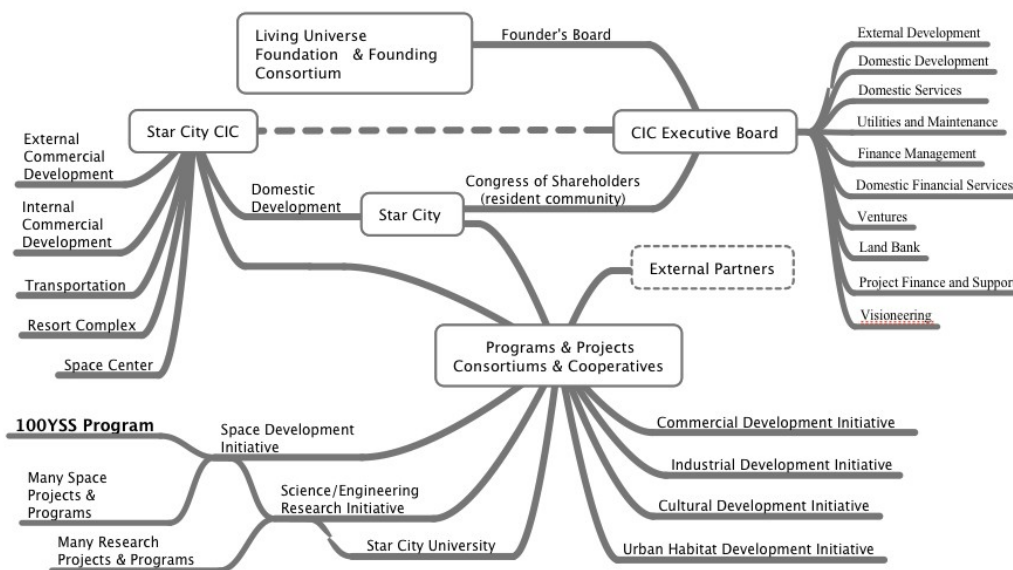
Examples of specific projects would be such things as enhancements to the city itself such as recreational facilities, public art projects, community Fab Labs and vertical farms, development and deployment of new energy systems, development of specific launch systems and their launch facilities, development of specific science facilities, orbital research labs, space telescopes, and so on. Some of these programs or projects may be specifically commercial in nature, such as a consortium formed to create a company to manage a space hotel, thus providing a necessary third party for realizing this application of one company's launch systems and another's habitat systems.

While in some ways similar to those of government agencies, these programs and projects would

rely on the consortiums/cooperatives created for their purpose with the Star City CIC a partner akin to other members, all of which are expected to contribute resources to the program or project and all of which share in the benefits, which may be such non-commercial things as the availability use of some new city facility or more commercial results rights to patented technologies produced, share of new companies formed, and the like. The city itself, as a social venue and physical concentrator of people with common interests, is intended to function as a catalyst for the creation of these consortiums and cooperatives but the CIC itself would additionally foster such activity through 'visioneering' by its own futurist Visioneering division. The Living Universe Foundation, in its role as space advocacy group, would also participate in this visioneering, relating to its larger vision of Marshal Savage's Millennial Project.

The individual consortiums and cooperatives would create their own independent management structures. For straightforward projects, these might be as simple as modest sized project teams. More elaborate programs may create perpetual executive boards with a more corporate management structure supporting multiple divisions and temporary project teams. In some cases, the end result may be a self-perpetuating company of very specific business model. The CIC would not take a direct part in program and project management beyond its role as a partner in the consortium or cooperative. It assumes a role primarily as philanthropic financial sponsor or investor, depending on the nature of the program or project and its support may take the form of financial aid or simply the providing, through its Land Bank, of city real estate or facilities for the consortium/cooperative's use. However, it would favor projects relating to its core imperatives of improving quality of life in the Star City, expanding its co-investment, and pursuing space development and the 100YSS. In some cases the city may be host to consortiums/cooperatives the CIC has no involvement in at all.

Star City Organizational Structure



Sources of Income & Fundraising Approach:

As previously described, initial formation of the Star City CIC would be based on a founding consortium of companies, academic institutions, and private investors interested in the creation of the city and its space center as a place to live, work, and pursue space development. One or several phases of initial investment and urban development may be pursued depending on the scale of support the initial solicitation efforts realize. We cannot entirely predict the composition of this founding consortium at present but would anticipate its likely participants to include one to a few established aerospace companies of a more entrepreneurial bent, a university, a resort and hotel developer, and any number of individual or group investors. These initial investors would essentially be contributing to a conventional real estate investment pool looking to purchase and initially develop the property of the Star City as a commercial venture in exchange for shares in its CIC and a scheduled ROI. As outlined in the previous section, this founding consortium is intended to initialize the CIC but eventually disperse its control and ownership to the much larger body of shareholders comprising the majority of residents of the city as it is developed.

With the CIC established the city as a whole and all businesses residing in it or which the CIC is invested in become a source of income directed to the city's maintenance, growth, improvement, and commercial investment with the surplus divided between shareholders and the program/project cooperatives/consortiums they deem worthy. Key among these programs, of course, would be the 100YSS program which is established from the start as a key imperative of the Star City. Projects and programs may also seek external participants that are not residents of the city nor have any investment links to the CIC but may want to participate for sake of the shared goals, shared technology, access to the city's exclusive facilities, or for mutual commercial interest. In some cases—particularly with declared Open Source projects—a portion of global society as a whole may become involved.

Programs and projects would be created as the objectives of specific cooperatives and consortiums that exist as largely independent entities with their own management teams and structures, though to foster their creation and perpetuation the CIC, city, and university would create some facilities for their logistical support. These can be non-profit or commercial in nature depending on purpose. Most would be non-profit, following the organization models common to large research programs and Open Source projects. The community, through the CIC, invests in these as a conventional consortium/cooperative partner. Other partners in and outside the community would include companies in related industries, the city's university, other academic institutions, and possibly governments where appropriate. CIC contributions would essentially take the form of money, physical space within the city or other CIC properties, access to facilities, and logistical support. (ie. conference facilities, administrative consulting, on-line communications, and so on)

Cooperatives and consortiums would be independently formed and solicit support from the CIC through presentations and reports communicated to—with the assistance of the CIC's Project Finance and Support and Visioneering divisions—the Congress of Shareholders which

democratically 'upvotes' such proposals to the CIC Executive Board, which then hands administration of funding to the Project Finance and Support division. CIC contribution would be reviewed and democratically re-ratified periodically. Often programs and projects would be cultivated in a top-down manner, proposed by the Visioning division to the Congress of Shareholders with the Project Financing and Support division then soliciting cooperative/consortium participants. And, of course, anyone in the Congress of Shareholders would also be able to propose programs and projects.

This concept of the whole city as economic engine of space development is critical. Everything the city and its CIC are commercially involved with in some way becomes a source of revenue supporting its chosen space development activities as a cultural imperative of the community. This may be lease income, direct return on venture investment, stock dividend, or cycled equity.

As noted in the vision section, space development is not economically sustainable at present because too little of its industrial/commercial potential is developed and the scope of any one conventional corporation is extremely limited. As far as its owners/stockholders are concerned, everything the conventional corporation does must have a narrow focus of industry or service. Using the city as a catalyst, we hope to move beyond this on this by creating an environment where the systematic development of this untapped potential can be pursued by companies working together as a community. As previously noted, we seek a space industrial ecology of horizontal competition and vertical cooperation just like that of the computer industry. That, however, will take time. In the meantime, the Star City itself, through the CIC and what it invests in, is capable of ten thousand different forms of industrial and commercial activity, many as spin-offs/derivatives of space activity, among any number of companies and ventures all tied together by two common needs—real estate and capital investment—which allows them all to be tapped, regardless of what they relate to in an industrial/commercial sense, as a source of income directed to space development goals as an imperative of that resident society.

It's like having a source of public money akin to a government agency except that there is no government involvement, no taxation, no political entities. The city is run as a for-profit venture. Its residents are its shareholders. They, as a democratic collective, choose how to spend their profit; what portion to keep for themselves, what portion for improvement to their community and quality of life, and what portion for other aspirations. They will choose to spend it on space because it's their shared cultural imperative; the *raison d'être* of the city. Why they went there to live. As a community, they all share this aspiration and the CIC allows them all to share in the economic and social benefits from that pursuit over time. As long as this cultural imperative can be maintained the economic engine of the community will be harnessed to that continuing effort.

The city's space programs are thus directly linked to the general productivity of the community and the society inhabiting it, but not in the authoritarian manner of a tax-based revenue scheme. There is no imposition upon the society here, no implied threat of institutional violence. People live in the city because they seek a better life there and intend to participate in its space goals as relevant to their interests, otherwise they can cash-out their holdings in the community and take their wealth elsewhere. As long as the city maintains that cultural focus, the portion of the global

society that shares that interest will seek to go there and participate and, as a side-effect of that cultural concentration, amplify and propagate that interest in the larger mainstream culture and creating gravitas for the city's growth and global support of its programs and projects.

Communities and their cultures can take the long view corporations and corporation-like governments no longer can. That is key to maintaining the pursuit of tasks that require centuries to accomplish. This is how cathedrals and pyramids were built. This is how you accomplish the big things on a civilization scale.

Investment Approach:

The primary economic objective of the Star City Community Investment Corporation is real estate development; the urban, commercial, and industrial development of the Star City. The purpose of this development is to improve the standard and quality of life of the inhabitants of the Star City and support the pursuit of their shared cultural objective of the exploration, development, and settlement of space and the deployment of advanced systems and spacecraft to further this effort among the stars. The CIC regards space development as, essentially, a form of real estate development producing properties and facilities as an extension of the properties of the city and its shared facilities. (note that not all real estate development is keyed to ownership of specific pieces of space. Certainly, no one owns the sea but that has presented no obstacle to the development of real estate aboard ships)

The CIC's investment priorities would be divided into several key areas; commercial development of it's own in-city land or architecture, external commercial real estate development, domestic venture investment, external venture investment, mutual funds, credit union (including personal and small business financial services), and programs/project. Discrete projects would be used for specific non-commercial improvements of scale to the city and its facilities. Each of these areas of investment are managed by their corresponding divisions of the CIC.

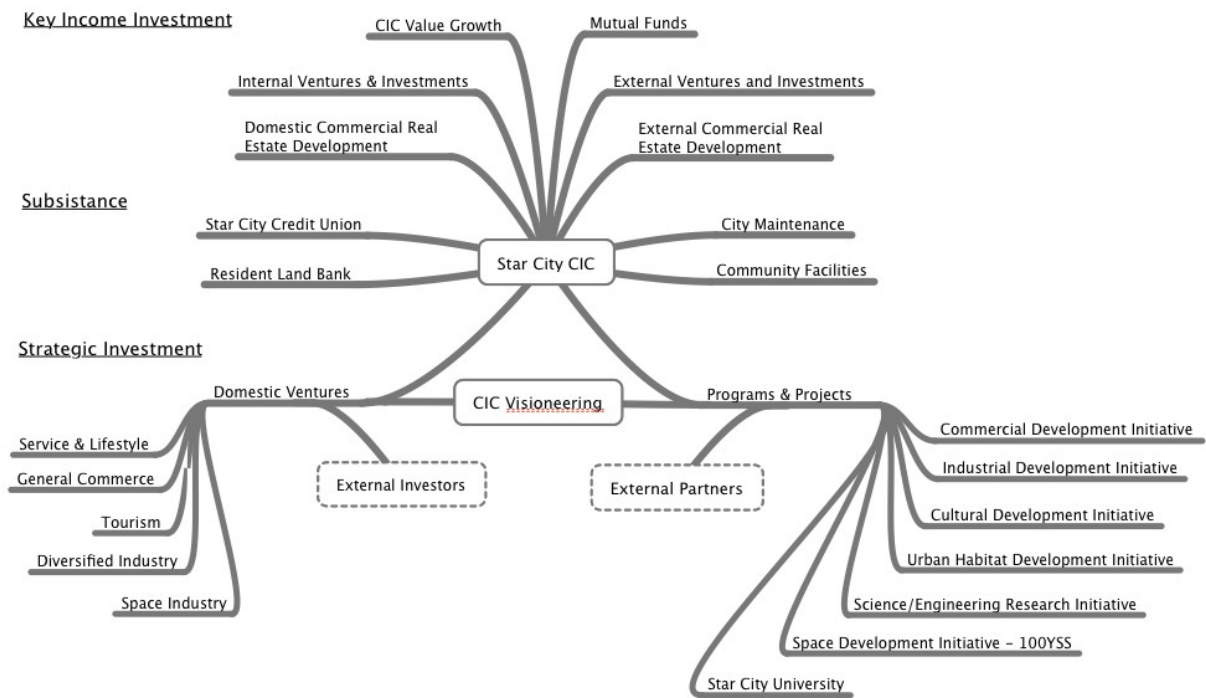
The basic goal of CIC venture investment is to cultivate resident space-oriented commercial and industrial activity. This would seek a logistically complimentary mix of companies that are well suited to working as a cooperative on the activities of the 100YSS program and on the systematic pursuit of new commercial and industrial applications. Through the several key development initiatives noted in the Star City organizational structure, the CIC would establish cooperative incubators for specific kinds of entrepreneurial companies, usually in cooperation with established resident companies who consider these complimentary. The Star City space center would be the key physical locus of this commercial space activity, the center equipped with launch support facilities, orbital systems ground support facilities, and a large amount of flexible light industrial 'skunkworks' space suited to a large variety of both commercial and non-commercial uses. Such space is also intended to anticipate later complimentary terrestrial production uses in support of space-based industrial production. Working space and employee residence space would be the primary venture contribution of the CIC to many ventures, the city sometimes speculatively investing in the creation of very specific facilities like its space center and commercial transportation facilities.

Though focused on the objectives of space development and the 100YSS as a core initial program, the inability of most space activities to directly turn a significant profit in the present compels the CIC to greatly diversify to include industries and commerce that may relate to space applications in some ways even if they are not, in the present, applied to that. For instance, it would be logical for the CIC to invest in companies in general aviation, robotics, computing, solar energy, and so on as these companies all could potentially contribute to (as co-op/consortium members), and benefit from, space applications later on as logical expansions of

their business. Thus the city doesn't simply cultivate space-specific businesses but rather a base of technical, industrial, and logistical capabilities that can be applied, through its programs and projects, to space activities and applications while being economically self-supporting as companies individually. There is no hope of direct profit from sending spacecraft to Proxima Centauri. Thus the infrastructure that enables doing that must be self-perpetuating in its own right—and profitable enough that it can afford to invest in programs like that for sake of less direct benefits.

The CIC's futurist division of Visioneering will be key in guiding the establishing of investment priorities that flesh out the anticipated capabilities needed for its key development initiatives while anticipating potential commercial space applications and profitable trends in technology. As a meta-corporation for a community, the CIC has, through its incentives, investment, and co-investment, the means to perceive and systematically cultivate whole infrastructures composed of any number of discrete companies and facilities in support of specific community objectives. This is a capability beyond the means of even the largest of conventional multinational corporations.

Star City CIC Investment Strategy



Statement of Work:

The functional beginning of the development of the Star City and the 100YSS program starts with establishing the consortium on which the Star City CIC would be founded. But before this can be realized, one must introduce the 100YSS and Star City concepts to the public at large and create a presentation package that can be used to solicit potential consortium members from the appropriate business communities. Thus the initial priority for this work, and the most practical use of the 100YSS grant funds, can be summed up in a single word; evangelism. We must cultivate these concepts into a coherent and compelling vision that can be presented to the public as a cultural ideal and model lifestyle and to aerospace businesses and finance people as a specific commercial development plan. It's important to point out that we must appeal simultaneously to the general public and the more specific business community because the credibility of these concepts does depend heavily on the gravitas they can generate in the mainstream culture. (as this author often suggests, there are very practical reasons why Wernher von Braun teamed up with Walt Disney)

Thus we propose to use these grant funds on a series of media projects along with a program of business plan and presentation package development that would be developed jointly by a media development team and a consortium development team, the former focused on mainstream evangelism and the latter on specific prospects for the Star City founding consortium. These projects would be conducted largely in parallel and, in addition to the basic promotional potential, they would be intended to produce an evolving portfolio of specific industrial and architectural designs that will be the basis of a media franchise, repurposed in other forms of media. This is a well proven approach common to science fiction media. Using CGI as a common basis of design development, all the projects proposed have the ability to co-support each other with parallel design and art development. This will economize on the overhead of graphics development, allowing us to better leverage grant funds for a greater impact. It is hoped the culmination of these media projects will be the creation of a media production team and eventually a media production company that can build upon the assets created in these projects to establish a self-perpetuating program of media evangelism. Let us examine these specific projects in more detail.

Project Presentation Package:

A combined architectural, design, engineering, and economic analysis would be conducted to develop a complete business plan and architectural master-plan for presentation to potential Star City consortium members. Though focused primarily on the Star City as a business venture, this would include the long-term economic and cultural objectives of the city and the basic development and deployment scheme for the 100YSS that is the ultimate long-term purpose of the city's development. It would also include detailed architectural schemes developed either by a partner entrepreneurial design firm or in invitational competition. This presentation package would comprise conventional analytical documentation as well as an assortment of visual media, relying heavily on the products of the architectural competition and other planned media projects. The LUF may

establish a promotional contract for the project with appropriate marketing firms or create its own working office for continual promotion and solicitation staffed by a modest team. Depending on the productivity of other supporting media development, we anticipate this project to take six months to one year to complete, though the protracted work of soliciting and gathering consortium members may take several years.

Considering the nature of this task, we anticipate the formal creation of the initial Founder's Board and Star City Community Investment Corporation resulting from this solicitation effort to be realized after the 24 month period noted for this grant. Though it might be realized sooner, it would be irresponsible to suggest this will happen in any short period of time. Space is a hard sell.

100YSS Web Site:

A web-presence site intended to host contact points for the Star City project and 100YSS program, streamlined presentations of the Star City and 100YSS visions, image galleries, access to news media packets, consortium solicitation material, as well as access to other forms of media produced for the project. Would also link to traditional social network sites; Facebook, Google+, Twitter, its own web/ mailing list forums, and blog.

100YSS Book:

A book project intended to produce a 'coffee table' style book to present our 100YSS development vision through an accessible visual narrative suited to a mainstream audience. The book would be published conventionally in hardcover and optionally softcover formats as well as digitally. This book project would not only produce a book but, comprising the most complete form of the 100YSS narrative, would serve as the core content generator for the other media projects, developing most of the industrial designs later repurposed for other media applications. Thus it would represent the largest project in terms of design and art development.

Whereas the formal business package for the Star City and 100YSS would focus largely on the Star City as a business venture and economic engine for the 100YSS, mainstream audience media, such as this book, would focus more on the narrative of the 100YSS program and its relation to a larger vision of future space development. It would present this pursuit as a way of life, with the Star City assuming the role of a setting for this activity and a vehicle for communicating an impression of a model lifestyle for those who pursue space development as a career and cultural aspiration.

As real estate marketing people well understand, you don't sell houses and buildings, you sell lifestyle. This points out a key missing element common in the traditional approaches of space agencies in communicating a coherent vision of a spacefaring future—largely because space development isn't yet commonly understood as a kind of real estate development. The focus is on hardware, technology, science, and missions in space, but

there is little discussion of living there, and **that** is ultimately what it's all about—what people most care about. That is the essential reason for going there that has been the common aspiration of 20th and now 21st century society. The public never lost The Dream. The system did.

In order to instill a cultural relevance to space development today we must link it to things that matter in a contemporary mainstream cultural sense (environment, energy, economics, personal/social empowerment, improved standards of living and quality of life) and cultivate impressions of a potentially high quality future lifestyle for those who participate in it. This, of course, is one the key aspirations of the Star City itself, but we must begin cultivating that impression even as we are initially presenting this vision to the world.

So the general approach of the 100YSS narrative would be that of a travelogue through space and time showcasing the lifestyle at specific places and points in time culminating in the greatest of all adventures; the journey to the stars. We will reuse or echo this same narrative through much of our other media.

Though space futurist books typically require several years to produce, we anticipate this more visual book project to take about a year to produce once the necessary stable of designers and artists is established. The LUF is in the unique position of already having at-hand a large portfolio of system and design concepts ready for illustration and further development by virtue of our continuing development of The Millennial Project as originally devised by Marshal T. Savage; the only comprehensive space development plan currently in existence covering, over the span of centuries, every development aspect from founding space advocacy group to the cultivation of a solar-system-wide civilization and the ultimate exploration and settlement of the galaxy. Thus much of the narrative of the 100YSS and Star City is already established as part of the broader and longer-term narrative we have developed for TMP and its media projects.

100YSS Videos:

A series of videos presenting the same narrative as the 100YSS book and based on the same series of industrial and architectural designs. A number of short visualization video clips would focus on discrete design elements and development stages in the larger narrative and would be intended for use on the program web site and for sharing with other documentary and news media producers. Shortened streamlined versions of the overall 100YSS narrative and the Star City presentation media would be created specifically for open on-line media distribution.

The culmination of the project would be a feature-length documentary video with the full 100YSS narrative intended for large screen presentation and release to the nature/science theme media networks, distribution in packaged media forms, for public showing at conferences and exhibitions, and for complimentary use with the 100YSS Portable

Exhibit.

These videos would be relatively modest productions—compared to typical feature film productions—based largely on CGI animation using models from our common design portfolio mutually developed among the whole series of media projects. Thus a relatively modest budget should suffice for their production. We anticipate these videos to be developed concurrently with other media projects—most closely with the book project—and with the feature length video being completed by the end of the 24 month term.

100YSS Portable Exhibit:

This would be a modest walk-through exhibit based largely on off-the-shelf trade show display systems and designed for relatively easy transport and deployment among various conference, exposition, and convention venues. It would rely largely on the reuse of the common CGI design portfolio and the book narrative for the creation of a series of linked double-sided banner/panel displays arranged in a walk-through maze structure with the addition of lighting effects, motion activated recordings and video clip projections, and the use of model exhibits. (possibly using the now off-the-shelf mobile 'Peppers Ghost' type 3D displays to allow for the stand-up display of many virtual models from our CGI portfolio)

Another possible feature may be a portable CAVE display system used to present a 3D surround video presentation offering a more detailed experience of possible spacecraft while discussing the nature of near-C space travel and the phenomenon associated with its relativistic effects. This would be co-developed with the video project.

A mini-theater may also be included with the exhibit to present the feature length 100YSS video and, tying the collective media development together, the exhibit would also be used as a venue to sell copies of the 100YSS book and videos.

Though for economy designed primarily with indoor venues in mind, the project may—depending on budget flexibility—include use of portable enclosures such as inflatable or geodesic exhibit domes to facilitate use in outdoor venues such as air shows and rocket meets.

Though possibly requiring no more than a few months to develop thanks to its reliance on largely off-the-shelf equipment, this exhibit is expected to be developed toward the end of the grant term due to its heavy reliance on visual media produced by the other media projects. The consortium development team, which would be making use of the Presentation Package, would also manage deployment of the exhibit in support of a general promotional effort and may also use this exhibit at industry-specific venues in addition to venues for the more general space enthusiast audience.

Cost Breakdown (as per SOW):

With Living Universe Foundation investing management staff from its established organization, grant funds should be about adequate to the tasks outlined in our proposed Statement of Work schedule. The vast majority of anticipated expense will be contracted labor for design and media production, as professional talent for space and science themed visualization tends to be somewhat scarce. Thus we anticipate the following costs breakdown.

Project and Design Presentation Package: \$200,000

- contracted economic and legal analysis and package development - \$50,000
(business and legal analysis done in a business school setting or by established consulting firm. May employ likely university consortium member)
- preliminary design for architectural master-plan - \$50,000
(cover exploratory design for shore and marine based forms with site logistics study. Likely use of one established design firm)
- presentation media package - \$50,000
(includes portable presentation media and give-away media. Would include use of the 100YSS Portable Exhibit)
- consortium evangelism/marketing (over initial 24 month term) - \$50,000
(likely 3 person volunteer staff from LUF core plus additional support from Portable Exhibit staff)

100YSS Web Site: \$20,000

- site hosting and administration - \$5000
(basic site host services and maintenance for 24 month term. Includes web site, simple 100YSS presentation, image gallery, blog, and storefront for media)
- site coding and development - \$5,000
(light skill level several hundred hours at \$10-\$15/hr. Includes web site, simple presentation, image gallery, blog, and storefront for media)
- site media content development - \$10,000
(specialized media content not part of book and video projects)

100YSS Book: \$100,000

- contracted content development and editing - \$80,000
(large format hardcover ~150 pages intended for ~20,000 unit print run. Includes development of key industrial design portfolio to leverage CGI based content with other

media)

-pre-publishing marketing costs (shopping the book) - \$20,000
(1 staff person for publisher search and/or later marketing over 12 months)

100YSS Videos: \$100,000

-contracted content development and editing - \$80,000
(relies on repurposing of book content and narrative for animation. Produces short clips for on-line and news media distribution as well as Portable Exhibit use and feature-length for cable network and CD distribution)

-digital distribution administration and on-demand disk production - \$20,000
(one volunteer staff member, equipment and supplies for 12 month period)

100YSS Portable Exhibit: \$80,000

-display systems, graphics, electronics - \$60,000
(50-75 display units with two sided graphics)

-exhibit transport, deployment, staffing (over initial 12 month term)- \$20,000
(likely 6-12 week long events per year with 3 person presentation team using rented transport)