MARKET FOCUSED DESIGN STRATEGY WING-IN-GROUND EFFECT VEHICLES; VIABLE TRANSPORT SYSTEM OR FLIGHT OF FANCY?

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Market Focused Design Strategy
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SUMMARY
The principles of WIG technology have been established for several decades, yet a substantial WIG market has yet to materialise. This paper considers non-technical factors that play a part in the technical design of a commercial WIG at industry start-up. Through simple desk-top 'market' research the influence of geographic, demographic, economic, political and competitive factors are explored; these are then set against established management models and anecdotal evidence to identify key geographic market regions and other messages that help focus WIG design criteria.

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1. INTRODUCTION

The principles of WIG technology have been established for several decades, yet a substantial WIG market has yet to materialise. Is WIG a solution for which there is no problem, or is commercialisation just around the corner? While others observe that WIG technology is in its infancy (equivalent to where the Wright brothers stood in the history of aviation (ref 1) commercial return on investment is needed to fuel further development. Moreover, from a competitive strategy viewpoint, early commercialisation could establish enduring market dominance.

This paper sets out to consider non-technical factors that play a part in the technical design of a commercial WIG, together with market entry and the development of competitive strategies, by building upon the views expressed in my article "Wing in Ground Effect - The Concept and the Market" (ref 2).

1.1. METHODOLOGY

The approach taken in this paper is to first consider the basic capabilities of WIG technology. Then, through simple desk-top 'market' research, it will explore the influence of factors such as economic, geographic, demographic and competitive environment; these will be set against some established management models and anecdotal evidence to help identify exactly where the real markets are and to focus design strategy towards satisfying those market needs. The analysis builds upon a framework of non-technical relationships, illustrated in Figure 1:

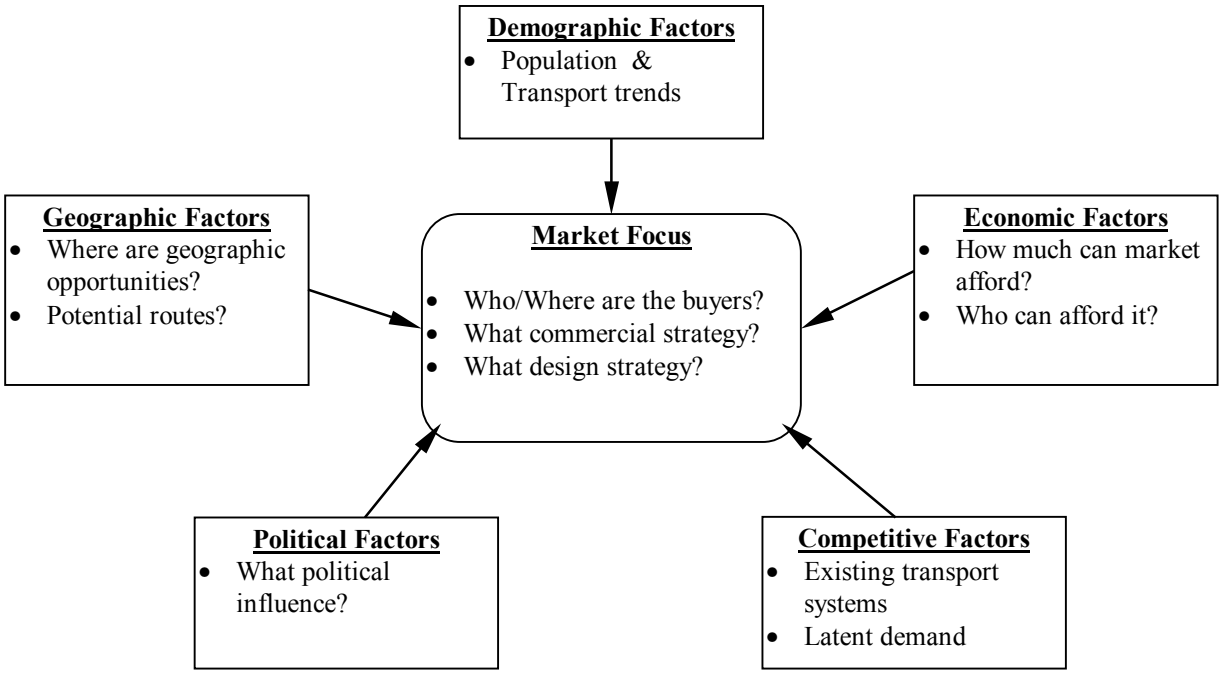

Figure 1

In contrast to some views that WIG is best done at large scale through military support, this paper takes the view that commercialisation of WIG will most likely arise through evolutionary development of small-scale civilian craft in ferry use. After all, the wave-piercing craft of the INCAT stable which have led the fast ferry revolution evolved in this way.

1.2. TOTAL DESIGN

As this paper aims to explore factors influencing design criteria, it is necessary to first be clear on what the totality of design is at such a formative stage of this market's evolution. Design must encompass:

1. design of suitable WIG vehicles
2. design of WIG manufacturing company
3. design of WIG operating company

Clearly, each of these points will impact upon each other, therefore design criteria must be those which satisfy all the above.

2. GEOGRAPHIC & DEMOGRAPHIC FACTORS

2.1. WHERE IS THE MARKET?

The extent of the potential global market is constrained by the fit of craft capability with geography and further constrained by the match of geographic routes with demographic opportunity. Put simply, the task is to find suitable routes where there are actually people requiring transport at either end.

2.2. REGIONS NOT ROUTES

There is also a business strategy element to this quest. Leading management guru Michael Porter (ref 3) believes success in global competition is dependant on first building a strong 'home' market. This should not be a monopoly market engendering complacency and protectionism but one in which competitors spar, thus encouraging product and market evolution. In addition, the high costs involved in servicing potential customers dispersed around the world make it far more attractive to focus on regions not routes. Further, since fast craft tend to need 'tuning' to their operational sea conditions, global standard design is unlikely. So, successful commercialisation is dependant on identification of not just the odd route but whole regions, and then integrating sufficiently with one of them (perhaps by setting up base there) for it to be called 'home'. For these reasons, this paper sets out to identify geographic regions as a starting point.

2.3. GEOGRAPHIC APPRAISAL

The starting point of the appraisal is the optimum operating profile of our 'base technology' small scale WIG of say 6 - 60 seats, representing the first three generations of commercial craft:

1. Operates at speeds in the region of twice to five times that of fast ferries
2. Has limited 'obstacle clearance'
3. Favours sheltered water

A notional operating range can be derived by assuming journey time and indicative operating speeds. Journey times between 30 and 120 minutes appear reasonable for this purpose, the lower figure representing the minimum journey likely to be worthwhile when set against quayside turnaround time and the upper representing a break point at which passengers would be prepared to endure a journey before opting for air travel. Clearly longer journey times are credible, but such routes would compete head-to-head with air travel unless tailored to a special purpose, perhaps transporting high value freight (as per Technosuperliner) or for military use. Such routes are not likely to be established in the early phases of WIG market development and would imply a large advanced machine - not the stuff of an industry start-up.

Taking current technology as a guide:

	Cruising speed		Distance Covered in Journey time. km		Distance Covered in Journey time. n miles	
	km/h	knots	Min 30 mins	Max. 120 mins	Min 30 mins	Max. 120 mins
Lun	450	243	225	900	122	486
A-90 Orlyonok	350	189	175	700	95	378
Raketa 2	180	97	90	360	49	194
Airfish	120	65	60	241	33	130
Jörg	176	95	88	352	48	190

From this it appears that a one-way range of between 40 and 480 nautical miles is within the grasp of existing technology. However, one could consider the technology of Lun and A-90 to be somewhat advanced for market start-up, so perhaps an upper

limit of 200 miles is a more appropriate basis for assessment. For maximum advantage one is searching for a latent demand on routes which are too short for airlines but too long for conventional or high speed ships (Rozhdestvensky & Kubo (ref 4) considered routes of 200km /125 miles ideal).

With these factors in mind a superficial examination of the globe, using an atlas, is both an illuminating and recommended starting point. Some geographic possibilities are set out in Appendix 1. This appraisal considers only marine based routes, although it is clear that land based routes opening up trade across land tracts such as desert, outback etc. are possible. Nor does the geographic assessment consider opportunities that may exist in the more hostile areas of the world, such as the Arctic Circle. For commercial start-up one needs as many elements in ones favour as possible!

By seeking general areas rather than specific routes, it is possible to summarise and settle quite quickly on the existence of three main zones of geographic opportunity in order of attractiveness (see also Appendix 2):

1. East Asia/Australasia
2. Caribbean
3. Europe

2.4. GEOGRAPHIC WITH DEMOGRAPHIC OVERLAY

2.4.1. East Asia

From a demographic viewpoint, East Asia offers truly huge potential as it covers an area embracing over 600 million people. The southern end offers extensive opportunity in an area of 2 million square miles including the coasts of Burma, Thailand, Cambodia and the Malay Archipelago whose 13,000 islands include Indonesia, the Philippines and Papua New Guinea. Indeed a population of some 268 million people reside in Indonesia, Malaysia and the Philippines alone.

The northern end embraces coastal China, Taiwan, Japan, Korea and some eastern Russian ports. The coastal development region of China comprises a population of 200 million, Japan 125 million and Taiwan 21.4 million.

2.4.2. Caribbean

Caribbean inter-island routes could be described as being in a corridor 300 miles wide by 2,000 miles long. While the geographic scale and possibilities presented by a string of populated islands appears attractive, the population density is rather low compared to that of East Asia; those islands identified in Appendix 3 account for only 35 million people, the largest centre being Cuba with some 11.2 million people. The islands are heavily reliant on the influx of tourist trade which boosts the need for transportation.

2.4.3. Europe

Europe is already well served by established modes of transport, however some areas exist in which WIG could succeed over other methods. Interconnecting services between numerous population centres around the Baltic sea of typically 0.5m people (Helsinki, Gdansk etc.) provide potential but are very much existing destinations and are already attracting fast ferry shipping. The coastal towns and islands of the Mediterranean, Adriatic & Aegean Seas offer potential routes, many of which are again already served by fast ferry/hydrofoil networks. The transport requirements of Italy and Greece, whose populations of 57.2m and 10.4m respectively are seasonally boosted by tourism, again offer scope for flexible operation of WIG. However, declining passenger numbers on Italian ferries due to direct airline competition has been reported, indicating an extremely aggressive market (ref 5).

3. ECONOMIC FACTORS

While the basic criteria for WIG opportunity are geography and demography, the underlying criteria for commercial success must be economic factors. If economic demand is a need combined with an ability to pay, the economic analysis for WIG should consider 'Who will pay and what can they afford?'. This question is equally applicable to both operator and passenger. Such factors produce design criteria drivers, particularly those resulting from any underlying cost constraints - both for capital and operational cost elements.

3.1. APPRAISAL

Gross Domestic Product (GDP) per capita is a useful scale for providing a general measurement of the wealth of a nation, while the rate of GDP growth is an indicator of whether that economy is growing or declining. These statistics are set out in Appendix 3 for selected countries to enable rough comparison. The UK's figures of $19,992 GDP per capita and 2.2% growth form a useful benchmark.

3.2. EAST ASIA

The East Asian/Pacific rim countries are a mixture of developed and developing economies which have, with the exception of Australia and Japan, high GDP growth rates. This is evidence of what has become known as the 'Asian miracle' (ref 6). Current projections are that high economic growth rates in East Asia and Pacific Rim countries will continue into the next century, by which time their economies will match those in Europe. Forecasts of Asia's success are something of a self-fulfilling prophecy - growth attracts investment, and investment creates growth.

Such dramatic growth in this one region is accompanied by high intra-regional competition, with competitive/economic advantage shifting from country to country as each develops. This process necessitates great flexibility (ref 7) of manufacturing and labour, bringing with it the need for highly flexible transportation systems that can adapt to changing balance.

3.3. CARIBBEAN

The Caribbean islands have small economies and are relatively poor with patchy growth. However, this is not the full picture of the islands' economic position; the Caribbean is heavily reliant on the tourist trade and it could be argued that services

which match the spending power of US and European tourists are viable. Indeed, the Flarecraft L-325 is already in taxi service in the Virgin Islands.

3.4. EUROPE

Europe is broadly the wealthiest region but the European economies are not growing much. It would be reasonable to assume that for European WIG applications the market could afford developed technologies (indeed, may have such expectations) on a par with existing rapid transport systems, fast ferries, Channel tunnel etc. However, it would be wrong to use this technological base for the other world markets.

3.5. SUMMARY

The three target regions have a range of economic positions that facilitate products of different levels of sophistication. The economics of East Asia favour introductory low-cost low-sophistication base technology achievable by start-up companies, yet their economic growth will enable swift evolution of WIG backed by increasing demand which will follow through to product maturity. The Caribbean has the appearance of a market suitable for intermediate craft, while Europe offers an additional market for mature design craft.

4. POLITICAL FACTORS

This section considers what governmental influence exists to support or oppose WIG development, especially if led by overseas (non-indigenous) companies.

The importance of sea trade to the economy has long been recognised. As 18th century economist Adam Smith observed (ref 8), sea-based trade is less expensive than overland trade, a fact that is still true despite the advent of railways, cars and air travel: *"So it is upon the sea-coasts, and along the banks of navigable rivers, that industry .... naturally begins to subdivide and improve itself, and it is frequently not till a long time after that those improvements extend themselves to inland parts of the country..."*

This has not escaped the planners of China whose program for its Coastal Development Region, based on 14 'open cities' and four economic zones along its 18,000 km of coastline, precedes inland development in its drive from rural to urban economy (ref 9). Already China's seaports have failed to keep up with demand although between 1978 and 1987 its sea port capacity virtually doubled. Nor are the seaports ideally located, leading to the wasteful transfer of large tonnage. The apparent inadequacy of China's transport system is a major constraint on its economic development. Clearly there is both need and opportunity to develop a sea borne transportation system which makes use of the smaller ports. For the rest of Asia, commerce and industry is forecast to broaden dramatically over the next two decades (ref 7), again bringing with it a demand for transportation system investment.

The strength of the connection between sea transportation and economic development is such that WIG should get political support in all regions; this applies particularly to Caribbean and East Asian regions where it could form part of the lifeline to the future,

achieving a technological 'leap frog' in the same way that mobile phones circumvented the constrained 'hardwired' infrastructure.

However, this does not equate to overcoming the lobbying power of those with vested interests in maintaining the status quo. Opposition could include existing ferry operators who see their livelihood under threat, the local shipbuilding industry, or even local government policy which restricts market access or investment by foreign players. The tariffs and subsidies enjoyed by players in certain countries, like Italy and Australia, are envied by those on more level playing fields. Opposition may depend on the degree to which the craft and its operation is supplied/serviced from local resources; joint ventures or 'technology transfer' with local agents may open access to otherwise difficult markets.

Market selection for start-up therefore depends not only on the geographic, demographic and economic factors, but also on the political forces that support or oppose it.

5. COMPETITIVE FACTORS

5.1. COMPETITION - WHAT COMPETITION?

In theory WIG faces direct competition from other operators and other transport systems, and indirect competition from systems such as telecommunications which reduce the need for travel.

5.2. DIRECT COMPETITION

Much direct competition can be avoided by careful selection of routes. Akagi (ref 10 & 11) developed scientific methods for assessing the competitive position of high speed marine passenger craft amongst high levels of direct competition from other ferry and transport systems in the area of the Seto Inland Sea. Although valid, this approach is less applicable for WIG since the high speed makes it a poor fit with existing seaborne traffic and therefore naturally inclines it to areas where competitors are few. In addition, for successful start-up it is perhaps unwise to engage in head-to-head competitive action against local established operators.

Notionally, WIG competes with all other forms of transport; with speeds in excess of 80 knots the obvious comparison is with aircraft. Where direct air travel is established it is entrenched, because any airline operation requires not just investment in the craft, but also considerable investment in fixed, ground-based assets such as airports. Indeed the total cost of air travel could be considered as: the cost of craft operation + cost of air traffic control + cost of airport operation. One advantage of WIG over aircraft is the minimal land based fixed assets/overheads necessary to service it. For example, the costs of maintaining airport facilities for flights through BAA airports adds on average £4.70 per passenger to the fare (ref 12). Further, since a major component of fare price is recovery of capital cost, WIG's potential to halve high speed craft capital cost places it in a very strong competitive position (e.g: Flarecraft L-325 5 seater WIG cost $240,000 compared to $500,000 for a 6 seat Piper Senica V or $780,000 for a Piper Malabou Mirage aircraft). Constraining component design to ship/surface vehicle technology rather than aerospace technology brings further reduction in maintenance

costs and so strengthens WIG's position vis-à-vis aircraft. Those countries which have strong air travel systems have no immediate need for WIG's and also powerful lobby forces to resist it. Opportunity exists in those counties with under-developed air transport while the other countries can be excluded from the list of locations for start-up.

EasyJet, the UK's new budget scheduled short-haul carrier, illustrates how to exploit the niche routes and destinations which big players have neglected (ref 13). Offering a 'no frills' service and focused on point to point travel demand rather than being part of a network, they look set to grow from start-up to a $100m profitable business in just two years. Absence of networked ticketing and in-flight meals gives it a competitive advantage of £10 per ticket over other air carriers. The owner/MD, Stelios Haji-Ioannou, built this airline upon the controversial premise that travel is price elastic; the lower the price is, the more people will travel. EasyJet serves as both a model and a potential threat for commercial WIG transportation.

Against this, deregulation of European airlines (ref 14) threatens aggressive price and market share competition, perhaps to slash one third off route prices (as it did in USA 20 years ago) and so put pressure on high speed surface transportation.

5.3. INDIRECT COMPETITION

International telecommunications is shrinking the world. Its growth could be viewed as 'indirect' competition. With teleconferencing, internet and soon video phone, long distance communication is possible without long distance travel. One may soon be able to cruise the world in virtual reality, making the need for real travel less certain. Indeed the British telecommunications firm BT promises to 'change the way we work' by promoting 'teleworking' - working from home instead of commuting. This does not necessarily forecast the end of travel, but it may cast an uncertain shadow over investment decisions in those transportation systems which require high fixed assets expenditure, such as railroads, roads or airports. The flexibility offered by WIG is that most of its asset value is in the revenue earning craft; this enables it to be re-deployed as necessary, thus giving it a strategic advantage in an uncertain world.

5.4. LATENT DEMAND

The scale of demand for high speed transport outstrips that which can be satisfied by existing transport means. This is illustrated by The Economist (ref 15) which reported that the International Air Transport Association believes Asias share of all air traffic will rise from a quarter in 1993 to over half by the year 2000. Indeed, for the past two years, Japanese travel to the rest of Asia has risen at more than 10% a year, while in the last fiscal year JAL took almost 20% more passengers to South-East Asia than during the year before.

In many parts of the world such demand for high speed travel is not matched by the availability of land for airport development, or time to develop it. This is especially true on islands; not all can make the $1bn investment in a new offshore airport facility, as did the Portuguese enclave Macau recently. As a strategy, while aiming for a growth market, proponents of WIG should aim to de-couple the demand for high speed transport from the 'need' to build transport infrastructure.

6. MARKET FOCUS

6.1. MARKETING STRATEGY - PRODUCT ADOPTION

Product perception and adoption is a function of how the culture of the market looks upon innovation, from the risk averse Europeans, the 'laissez faire' Caribbeans, to the adventurous East Asians who are prepared to adopt new technology without sentimental attachment to that which went before.

How craft are portrayed within a marketing strategy will have impact on the design criteria, since both will influence how the craft/manufacturer/operator will be perceived or portrayed. This can be simply illustrated by the following matrix:

Market	Product: Existing	Product: New
Existing	1	3
New	2	4

1. Existing Product/Existing Market: A proven vessel on an established route
2. Existing Product/New Market: A proven vessel exploring a new route
3. New Product/Existing Market: A new unproven vessel on an existing route
4. New Product/New Market: A new unproven vessel on new route

Superficially, WIG appears to fall into sectors 3 and 4. However, the risk to an existing operator is considerable in these sectors. Ferry operators may not wish to dilute their already successful portfolio with an unproved product or service, so one cannot expect them to leap at the chance to buy WIG. Persuading an existing ferry operator to take the leap of faith from boat to WIG is likely to be more difficult than asking the same of its passengers. Besides, an ideal WIG route is one not hampered by existing traffic in sector 3.

This raises the question of who the operators (buyers) will be, since the problem is rather circular - until proven, the risk is off-putting. The solution adopted in the early years of the hovercraft was to form close alliances between manufacturers/research bodies and pioneer operators which enabled early craft to function as technical and commercial demonstrators. Indeed, the parallel between the commercialisation of hovercraft and WIG start-up has not escaped John Leslie of Sea Wing International (ref 16). Clearly then, in the quest for commercialisation, new operators (perhaps from aviation) are every bit as attractive as existing ones. Also, the earlier operational service is achieved the better foothold is established for further market exploitation.

To the travelling public, product newness may attract novelty interest but not necessarily custom, because unfamiliarity leads to high perceived risk. This indicates the need to design in 'familiarity', to place it closer to existing products in sectors 1 or 2, so minimising uncertainty. In the same way that the channel tunnel has become 'just a train' in the current Eurostar TV advertisements, perhaps WIG should be promoted as 'just a boat'.

6.2. THE HIGH TECH WARNING

The Economist (ref 17) highlighted the increasing industry concentration in the field of defence, as exemplified by the activities of giants Lockheed Martin, Boeing, Raytheon & Northrop Grumman. Defence companies are moving towards globalisation, driven by scale economies, global dispersal of skills & expertise, the sheer size of investment necessary to remain in the game and the need to match that investment from earnings which can only be achieved by spreading sales across a number of nations. *'In the long run aerospace companies may take over the making of ships and armoured vehicles'* the Economist observed. Lockheed Martin and Northrop Grumman are already competing to build the US "arsenal ship".

The more ship/boat technology moves towards aircraft technology, the greater the chance of the market being snapped up by an industrial giant. Fast ferries and now WIG are moving closer to such giants home ground. Boeing already made one foray into the ferry industry with Jetfoil while the others have played a part in hydrofoil and hovercraft research.

What has been learned from both the hydrofoil and the hovercraft development story is that such concepts only really become commercially viable/attractive once the concept is 'de-teched' i.e., the aerospace content has been stripped to a minimum. This has less to do with the technology itself but is most likely a function of the culture of the market/operators and their supporting infrastructure (maintenance skills etc.). The message is that, although big high-tech military projects fall into the lap of the giants, they could face major problems in getting them adopted. The future of smaller, lower-tech projects are less likely to be threatened in this way.

7. DESIGN MESSAGES & STRATEGY

The purpose of the review so far has been to consider those factors that would influence the successful (or otherwise) start-up of commercial WIG transportation. At this point the aim is to translate those factors into broad design strategy for a vehicle, compatible with both manufacturing company and operating company.

By bringing together the various factors one can begin to focus on who potential buyers/operators and customers are and where they are located. The geographic, demographic and economic analysis identified three market regions in order of attractiveness for start-up: Far East, Caribbean, and Europe. Selection of a definitive location enables basic physical criteria to be assessed; e.g. sea conditions, heat, humidity, sand ingestion, reliability, maintenance requirements etc. The economic position of these markets provides messages about capital and running costs constraints, level of sophistication, materials, maintenance, and simplicity of design.

Political considerations concerning market start-up and market entry may further refine the location decision, while circumvention of trade barriers through technology transfer or joint ventures may influence design through the degree of technology to be transferred, local material, local labour and local skills to be accommodated.

Assessment of competitive factors again suggests certain capital and running cost constraints, aiming for significantly lower costs than for aircraft. This implies alternative construction methods and materials, and minimal 'aerospace' technology. Minimal reliance on fixed shore based assets are part of WIG's 'unique selling proposition', which implies building in a high degree of self-containment in the craft design.

Perceptual and market positioning will influence adoption, as does cultural conservatism, which suggests that, while WIG is new, part of the design brief must be to make it familiar. Finally, the 'high-tech warning' underlines the need, from a commercial strategy perspective, for start-up WIG manufacturers to minimise 'aerospace' content.

8. CONCLUSIONS.

Someone once said it often takes a generation before an idea becomes widely adopted. This paper holds the view that WIG is not a flight of fancy, but is the basis of a commercially viable WIG transport system, in the right market. The present question marks over its future are symptomatic of the concepts status as a 'problem child' within the classical management theory Boston Consulting Group matrix as it evolves to 'rising star' and then to 'cash cow' (ref 18).

This paper has indicated market opportunities around the globe where, from start-up, the WIG concept meets local transport needs and complements local economic development. The potential size of these markets is too large to be labelled as 'niche'. The appraisal illustrates the natural advantage that Far Eastern companies will have in the development of WIG. As the technology develops and becomes more widely adopted, the experience gained will enable craft to increase in size. As this happens, established aerospace companies may attempt to enter the sector. However, at the same time operators who are risk averse will polarise the market and so restrict the number of players. This does not bode well for British industry who will have to work hard to overcome geographic disadvantage or manage without the revenue or technical experience foreign players will gain from this potentially lucrative market.

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Appendix 1
PRELIMINARY ASSESSMENT OF GEOGRAPHIC OPPORTUNITIES

(Population figures in brackets)

1) ASIA, AUSTRALASIA, INDIAN & PACIFIC OCEAN

India/Bangladesh: Maldives inter-island, Bay of Bengal, Mouths of the Ganges

South East Asia/Pacific rim: Coastal Burma, Thailand-Cambodia, Malaya peninsular, Indonesia, Papua New Guinea, Philippines. Route example:

Jakarta (6.5m) (Java) to the 600 islands comprising the 'Thousand Islands' off Jakarta.

Sea of Japan, Sea of Okhotsk, East China Sea, South China Sea, Japan - inter island, China - coastal, East China Sea, Yellow Sea. Route examples:

Kitakyushu (1.065m) (Japan) - Pusan (3.16m) (South Korea) 150 miles.

Taipei (2.1m) (Taiwan) - Fuzhou (1.12m)(China) 150 miles.

Australia: East Coast - Great Barrier Reef 100 miles round trip

2) LATIN AMERICA & CARIBBEAN

Caribbean Sea/Gulf of Mexico area: Islands of Greater & Lesser Antilles (from Miami through to Trinidad)

3) EUROPE, COMMONWEALTH OF INDEPENDENT STATES

Baltic Sea area: Coastal Finland-Sweden-Poland-Germany-Denmark-Estonia-Latvia-Lithuania-Russia. Route Examples:

Helsinki (0.48m) (Finland) - St Petersburg (4.4m) (Russia) 200 miles

Göteborg (0.443m) - Copenhagen (0.466m) 170 miles

Mediterranean Sea area: coastal townships southern Europe & North Africa, Islands of Adriatic & Aegean Sea. Route examples:

Monaco - Ajaccio (Corsica) 150 miles

Tunis (0.597m) (Tunisia) - Palermo (Sicily 4.628m) 200 miles

Limassol (0.12m) Cyprus - Beirut (0.45m) Lebanon 150 miles

Split (0.236m) - Pescara (0.131m) Italy 145 miles

Valencia (Spain) - Ibiza- Majorca - Minorca?

Other areas: English Channel? Channel Islands? Black sea? Caspian Sea?

4) MIDDLE EAST & NORTH AFRICA

Red Sea, Persian Gulf

5) NORTH AMERICA

Great Lakes? North Canada? Gulf of St. Lawrence?

6) SUB SAHARAN AFRICA

None.

7) SOUTH AMERICA

Amazon basin?

8) ARCTIC & ANTARCTIC CIRCLES

Not considered.

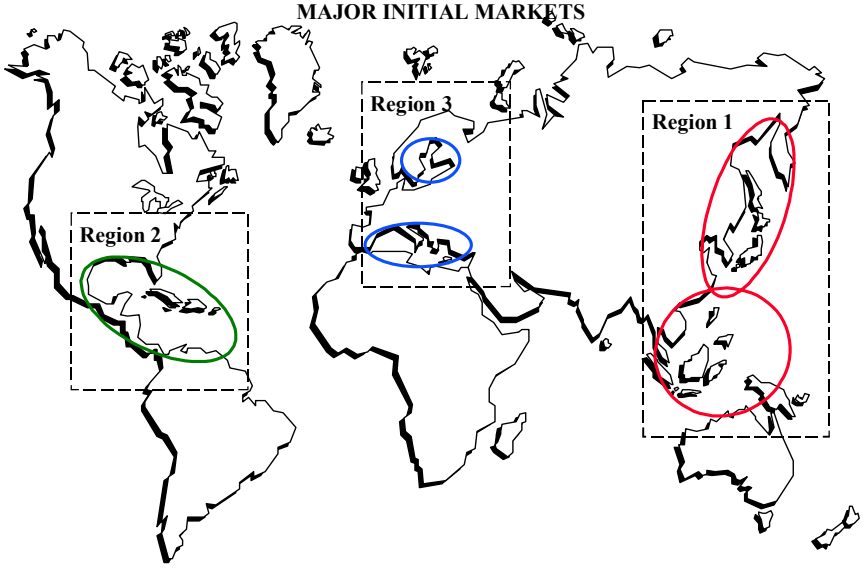
Appendix 2

Appendix 2.

***Figure 1*:**

WORLD-WIDE W.I.G. OPPORTUNITIES

MAJOR INITIAL MARKETS



Appendix 3

Demographic and Economic Statistics for Selected Countries (1996)

Source: Derived from World Outlook 1997. The Economist Economic Unit

	GDP US$bn	Population million	GDP per capita US$	Real GDP Growth %
Selected East Asia/Pacific Rim Countries				
Australia	389.7	18.73	20,806	3.60
China	836.5	1,227.00	682	9.10
Hong Kong	123.2	6.31	19,525	4.30
Indonesia	221.3	196.90	1,124	7.10
Japan	4,336.8	125.90	34,446	3.90
Malaysia	88.4	20.60	4,291	8.30
Philippines	84.0	69.80	1,203	5.00
Singapore	90.7	1.30	69,769	6.50
South Korea	439.2	45.30	9,696	6.80
Taiwan	268.8	21.40	12,562	5.80
Thailand	184.3	61.30	3,007	7.20
Vietnam	22.2	75.30	295	9.20
Bangladesh	31.8	123.00	259	4.70
Selected Caribbean Islands				
Antigua & Barbuda	0.5	0.06	7,197	4.70
Bahamas	3.5	0.28	12,844	3.00
Barbados	1.9	0.26	7,387	4.80
Bermuda	0.2	0.06	3,148	0.50
Cuba	13.9	11.20	1,241	5.00
Jamaica	6.2	2.60	2,382	0.50
St Kitts & Nevis	0.2	0.04	4,906	4.00
St Lucia	0.5	0.15	3,477	4.30
St Vincent & Grenadines (1995)	0.2	0.11	2,005	3.80
Trinidad & Tobago	5.3	1.30	4,109	5.40
Dominican Republic	12.8	8.10	1,580	3.90
Dominica	0.2	0.07	2,537	1.70
Haiti	3.2	7.20	442	3.70
Puerto Rico (GNP)	30.6	3.76	8,136	3.00
Selected European Countries				
UK	1,173.9	58.80	19,965	2.20
Greece	104.6	10.40	10,053	2.20
Italy	1,066.0	57.20	18,637	
Norway	127.9	4.38	29,193	4.80
Denmark	143.8	5.20	27,654	1.80
Sweden	211.6	8.88	23,832	2.00
North America				
USA	7,586.0	266.10	28,508	2.30
Canada	581.7	30.00	19,389	1.60