

APPENDIX 2 – PERSPECTIVES

ISSUES

1. NASA is a Cold War barrier to trade
2. Technological barriers are not the key constraint
3. The key constraint is bureaucratic
4. The civilian space travel market already exists

PERSPECTIVE	NASA	
	1 st and 2 nd Phase Industrial Age Organizations	3 rd Phase Concept

Political Trade Barrier	Protects US interests	Protects its own self-preservation interests	No longer required
Technology Barrier	Develops and Controls key technology	No longer leading edge—competes with other country's private enterprise, and not very well	NASA focuses on scientific and military assistance. Enabling technology transferred to control by private enterprise
Institutional Barrier		Ties up capital and resources	NASA focuses on government mission
Civilian Market	Does not exist	Independent emergent civilian access is a threat to NASA's control of space economy	NASA enables industry to create, build and service civilian market

APPENDIX 3 – NAGATA (2007) COMPARISON OF COSTS [Direct quote]

Fig. 1 shows the cost breakdown per flight for the present expendable rocket, the Space Shuttle, and a transportation vehicle for space tourism. Since the expendable rocket is new every flight, the major part of the cost is manufacture. The cost of the Space Shuttle is estimated based on 6 flights a year. About 10,000 people are involved in the Space Shuttle program. The cost is the same as that obtained by dividing personnel cost by the number of flights. Looking at the space-travel vehicle, if we assume (based on the survey results) that a ticket is 2 million yen and the number of passengers per flight is 50, the income for one flight becomes 100 million yen. According to airline-company balance sheets, amortization costs are about 10~15% of expenditure other than direct/indirect costs for operation. Since income per flight is 100 million yen and depreciation is about 10 million yen, we can estimate that, if the space vehicle costs tens of billions of yen, a thousand flights would be requested. This shows that the cost of development and fabrication of reusable vehicles has little significance. We can obtain an economic return by making a sufficiently large number of repeat flights.

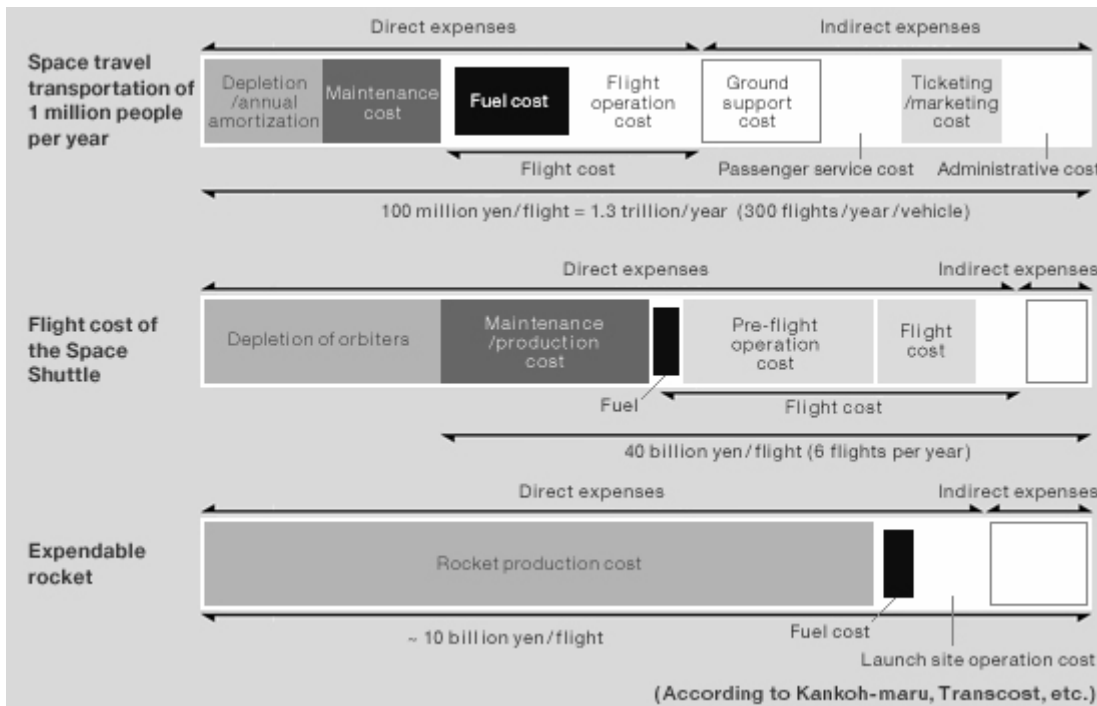


Figure 1. Breakdown of flight cost

Therefore, a system to transport these travelers could become a trillion-yen business in annual income. Couldn't the money to develop a new rocket for such a business be collected easily? A system to perform dozens of flights every day, like a transport convoy, is necessary in both cases. Rockets which are trashed every flight cannot support such a system. Coincidentally, the volume of transportation and cost of flights needed for both projects are almost the same, as shown in Table 1. Based on this table, I will discuss here a reusable vehicle with real commercial demand.