

# New global mega airports

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9   **Abstract**

10   World-class airports are center hubs of a country's economic engine. They play a pivotal role in driving  
11   the economy of any country. This is particularly the case when a New Global Mega Airport (NGMA) is  
12   built. Currently, only a few NGMAs are being built, or proposed in the world. They are mostly in the Far  
13   East and the Middle East. No new airports of global mega magnitude can be found in the U.S., or in  
14   Europe, other than various airfield and terminal expansion programs or upgrades.

15       This paper discusses where NGMAs are being developed currently in the world. The paper describes  
16   the author's definition of NGMAs, their latest development trends, their characteristics, and prime  
17   reasons for their development. The examples discussed in this paper include the Peking Daxing  
18   International, the New Dubai International, the Istanbul New Airport, and the New Manila International  
19   Airport. Each NGMA example is discussed to demonstrate the common characteristics of NGMAs. The  
20   paper is concluded with observations of how they impact the future of airport planning.

22   **Keywords:**

23   NGMAs; airports; runways; world; global; terminal; long-term

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## 24 **1 Introduction**

25 New Global Mega Airports (NGMAs) is a term to describe a recent airport development trend of a new  
26 class of airports of global magnitude. As major airports continue to expand to meet the ever-increasing  
27 air traffic demand, airport authorities and planners have come to realize that continuing airport  
28 expansion is no longer a viable option, simply because of one undeniable fact - the land constraint, i.e.,  
29 the lack of land for expansion. This is particularly the case for western developed countries like the U.S.  
30 and those in Europe.

31 For the last few years, NGMAs, as I labeled them, have emerged in the field of Airport Planning to  
32 answer one specific question, "How could airports be planned and built to ultimately solve the problem  
33 of ever-increasing air traffic demand in the global market environment?"

34 Currently, only a few NGMAs are being built, or proposed, in the world. Interestingly, no NGMAs can  
35 be found in the U.S. or in Europe. NGMAs are found in emerging economic "power houses" in the Far  
36 East and the Middle East.

37 This paper discusses where NGMAs are currently developed or proposed in the world. The paper  
38 defines what NGMAs are, discusses the overriding reasons of their development and characteristics.  
39 The purpose of this paper is not to compare them, but rather to highlight the NGMAs as a new airport  
40 development trend, a phenomenon, in airport planning. This paper describes four NGMA examples: the  
41 Peking Daxing International, the New Dubai International, the Istanbul New Airport, and the New Manila  
42 International Airport. The first three are in the process of construction. Continued phase-in development  
43 is expected. The fourth one is in the process of selecting the final bid. The conclusion of this paper  
44 highlights the author's observations on how NGMAs impact the future of airport planning.

## 45 **2 New Global Mega Airports (NGMAs)**

46 Aviation is a prime catalyst for international trade, commerce, and infrastructure development of a  
47 country. As major airports around the world are moving toward a global scale, most of them are suffering  
48 from severe air traffic congestion or from the lack of capacity to accommodate the ever-increasing  
49 demand. Since the turn of the century, world-class airports from developed countries like the U.S. and in

50 Europe have found themselves more and more “land constrained.” Airport authorities and planners  
 51 have come to realize that the “bandage approach” of upgrading and “piecemeal” expansion is no longer  
 52 a viable long-term solution. On the other hand, building new airports to replace existing airports is  
 53 increasing remote due to the lack of political support and increasing environmental concerns. More  
 54 importantly, the lack of financial resources continues to plague the idea of building new global  
 55 magnitude airports. This is particularly the case in the U.S. and in Europe.

56 For the last few years, a new phenomenon has emerged. New world-class airports of mega  
 57 magnitude, defined as “New Global Mega Airports” (NGMAs) are beginning to develop in the Far East  
 58 and the Middle East. At least four NGMAs either are in the process of construction, or proposed,  
 59 including one each in China, United Arab Emirates (UAE), Turkey, and the Philippines. All of them  
 60 exhibit very similar development characteristics as follows:

- 61 • Strong national interest and political support in achieving a long-term global aviation dominance
- 62 • Commitment to replacing existing, or build, a new airport in a global scale
- 63 • Large financial resources and backing
- 64 • Huge availability of land resource
- 65 • Incorporation of the latest technology and construction know-how’s, and
- 66 • Action-oriented commitment toward meeting target objectives and project completion

67  
 68 Tables 1 to 3 provide a glimpse of these NGMAs in terms of their development characteristics. These  
 69 examples include the New Beijing Daxing International, the New Dubai Al Maktoum International, the  
 70 Turkey New, and the proposed New Manila Airports.

71 **Table 1** Common characteristics of new global mega airports (NGMAS)

<b>New Global Mega Airports</b>	<b>National Prestige &amp; Support</b>	<b>Build New or Replace Existing Airport</b>	<b>Global Aviation Leadership Dominance</b>	<b>Finance Resources</b>	<b>Land Availability</b>	<b>Action Oriented /Target Meeting</b>
Beijing Daxing International	√	New	√	√	√	√
Dubai Ai Maktoum International	√	New	√	√	√	√
Istanbul New Airport	√	Replace	√	√	√	√
New Manila International	√	Replace	Potential	√	√	Planning

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**Table 2** New global mega airport – an integrated airport system

New Global Mega Airports	Long-Term Goals		Multimodal Transportation Hub				
	Capacity Needs	Economic /Develop't Needs	High-Speed Rail	Multi-Modal	Metro Connect-ion	Logistic / FTZ*/ Container Terminal	High - Tech
Beijing Daxing Inter'l	√	√	√	√	√	√	√
Dubai Al Maktoum	√	√	Potential	√	√	√	√
Istanbul New	√	√	√	√	√	√	√
New Manila Inter'l	√	√	√	√	√	√	√

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\*FTZ=Free Trade Zones

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**Table 3** Long-term planning of new global mega airports

New Global Mega Airports	Year			Total Cost (\$b)		Area	# of Runway		# of Terminals		An. Pax Capacity (m)			Construct-ion
	Begin	Open	Ult.	Initial	End	Ha.	Initial	End	Initial	Ult.	Initial	Cur.	Ult.	
Beijing Daxing Inter'l	2014	2018	2019	13.0	NA	2,668	4	8-9	1 Main	6-Tier	45.0	0.0	130-200	Phase-In
Dubai Al Maktoum	2010	2017	2027*	32.0	NA	14,000	1	5	1 Main	3	120.0	0.4	200	Phase-In
Istanbul New Airport	2014	2018	2030	11.3	NA	7,659	3	6	1 Main	4	90.0	0.0	150	Phase-In
New Manila Airport	NA	NA	2040	2.0	20	1,600	4	6	1 Main	4	66.0	NA	100	Phase-In

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80

(Sources: Various, \*CNN, Oct .2013)

### 81 3 Development of Beijing Daxing international

82 For the last decade, China's aviation growth was phenomenal. The existing Beijing Capital International  
83 Airport had an annual capacity of 75 million passengers. Its new Terminal 3 was completed just in time  
84 to meet the 2008 Olympics. In 2015, the airport handled 89 million passengers already (Wikipedia,  
85 2017). Its design capacity was no longer sufficient to meet ongoing traffic increase. Beijing Capital  
86 International is one of the major airports in the world that suffers from long aircraft delays (South China  
87 Morning Post, 2015). Construction of the new Beijing Daxing International since 2014 was indeed a  
88 necessity.

89 In fact, construction of Beijing Daxing has long been on the agenda of China's 12<sup>th</sup> Five Year Plan  
90 (2011-2015) to improve the nation's transportation infrastructure. For the last decade, China's aviation  
91 industry, particularly Beijing, has contributed significant economic growth for the country. A few years  
92 back, the average GDP growth was about 10% per year and was projected to be 9.5% per year for the  
93 next 5 to 10 years. Last year, the aviation industry in China enjoyed combined profits of 43 billion Yuan,  
94 three times as much from the previous year. As the second largest economy in the world, the Chinese  
95 Government has long wanted Beijing's Capital International to surpass Atlanta Hartsfield International

96 Airport in the U.S. as the world's busiest airport. By opening of Beijing Daxing International in 2018,  
97 China will have the opportunity to fulfill this dream.

98 Unlike other Asian countries such as Japan, South Korea, Indonesia, Thailand and Singapore, China  
99 has the land resources and all the available capacities to build another global airport of mega  
100 magnitude. A majority of the traffic going through Beijing is made up of domestic travelers. Millions of  
101 migrants from rural communities in Central and Western China swarmed into big urban cities like  
102 Beijing, transforming Beijing into one of the world's most populated megacity. According to The  
103 Telegraph from the UK, the domestic passengers have already outnumbered international travelers  
104 four-to-one at Beijing's Capital Airport in 2011 (Moore, 2011). Given the continuing growth of population  
105 and urbanization, Beijing continues to accelerate its metropolis and business growth. Building another  
106 global airport was a logical step to further fostering its economic growth and foreign investments for  
107 local, regional, and international opportunities.

108 China's aviation growth is also contributed by its geographical size. During the last decade, China has  
109 shown the world that the country is going to be the next world's aviation giant. In 2009, the number of  
110 civil airports opened for air traffic was 166. This number is expected to increase with Beijing being their  
111 primary connection hub. One of the reasons for construction of more new airports is the result of  
112 proliferation of Chinese low-cost airlines. According to China's aviation industry forecast, China is  
113 expected to purchase at least 4,300 new jet aircraft over the upcoming two decades (Moore, 2011).  
114 Such projection will continue to foster China's economic growth, global trade, and investments into and  
115 out of the country. Ongoing infrastructure and investments in Beijing will ensure China's economic  
116 prosperity as a mega political, economic and global business powerhouse in the world.

#### 117 **4 The Characteristics of Daxing International Airport**

118 China's vision is to build Beijing into the world's largest aviation hub. The New Daxing International  
119 Airport covers an area of 2,680 hectares (6,620 acres). The airport is built on a new  
120 54-square-kilometer Daxing site, a rural area located 46 km south of the city.

121 Initial Daxing Master Plan indicated planning of nine parallel runways, eight runways for civil aviation  
122 plus one runway dedicated to military use. Initially, the airport will accommodate 45 million passengers

123 per year. The new airport is envisioned to outperform Beijing Capital International, as the World's  
124 busiest and the largest airport in China. More recent airfield design updates featured eight runways.  
125 The latest terminal design of Daxing simulates a massive starfish with a 5-km long terminal façade and  
126 872 aircraft stands (Melcher, 2015). The concept was based on sustainability, adaptability and serving  
127 as a multimodal transportation hub connected by metro and high-speed rail lines. More recent news  
128 indicated that the new airport is scheduled for completion in 2018.



129 **Fig.1** Beijing Daxing International Master Plan, **Fig. 2** Beijing Daxing International Terminal Design  
130 Source: Netherlands Airport Consultants (NACO) Source: Zaha Hadid Architects, 7/  
131  
132

133 Construction of the new airport began in late 2014. Future plans will expand the airport to 120 and  
134 ultimately to 200 million passengers per year. Rail lines will provide a direct link between Beijing Capital  
135 International for domestic passenger transfer and for Beijing city center. A new high-speed rail link is  
136 planned linking other regional cities like Tianjin, Shenyang, Shijiazhuang, Shanghai, and Southern  
137 China. The airport is expected to be a catalyst for the region's economic development including the City  
138 of Tianjin and the Hubei Province.

139 It has been said that the New Daxing International Airport would be the world's largest airport.  
140 However, other NGMAs such as the Dubai Al Maktoum International in the United Arab Emirates (UAE),  
141 and the Istanbul New Airport in Turkey, and the proposed New Manila International Airport in the  
142 Philippines are now challenging the position of China's Daxing International.

### 143 **5 Development of the New Dubai Al Maktoum International Airport**

144 Dubai is one of the seven emirates constituting the United Arab Emirates (UAE). It is the fastest growing

145 mega city in the Middle East. Its current airport, Dubai International is the home of the United Arab  
146 Emirates Airlines. The airport is serving as the gateway to international markets for Dubai. The airport  
147 is located 23 miles outside Dubai, and is well connected by major roadways to various industrial and  
148 trade centers. However, the airport has limited options for expansion.

149 In 2010, Dubai announced the building of its second airport, Al Maktoum International. In 2013, cargo  
150 operations started at this airport. In 2014, the Government of Dubai announced a massive US\$32 billion  
151 expansion program, turning the airport into a mega airport of global magnitude. News media publicizes  
152 the new airport as “Dubai World Central”, a purpose-built "airport city".

153 The Government of Dubai strategically envisions Al Maktoum International to be the biggest airport in  
154 the world. The plan is to prepare the airport to be an airport city, an iconic tourism destination and an  
155 international hub for trade. According to Paul Griffiths, CEO of Dubai Airports, quote, “Our future lies at  
156 Dubai World Central (DWC). The announcement of this \$32 billion development of DWC is both timely  
157 and a strong endorsement of Dubai’s aviation industry,” unquote (Businessinsider, 2017).

## 158 **6 The characteristics of Dubai Al Maktoum international airport**

159 The new airport covers a mega area of 14,000 hectares, with a multi-phase urban infrastructure  
160 development plan to elevate Dubai into a leading aviation and logistic hub, and a thriving metropolis in  
161 the world. Passenger service commenced last year. This 54-square mile airport metropolis will feature  
162 everything from commercial, residential, and leisure developments to state-of-the-art cargo and  
163 passenger operation. Al Maktoum International is expected to handle 120 million passengers a year,  
164 making it the busiest airport in the world.

165 Al Maktoum International is planned for completion in by 2027. The final plan is expected to  
166 accommodate up to 100 Airbus A380 Superjumbo simultaneously and 200 million passengers per year.  
167 By 2020, the airport is expected to support more than 322,000 jobs and account for as much as 28% of  
168 Dubai's GDP. The new airport will be connected via a dedicated single cargo custom bonded free zone  
169 in a multimodal logistic platform. Dubai World Central will provide direct access to sea, air, rail, and the  
170 UAE's highway network. Phase I of Dubai Al Maktoum International Airport is already completed and in  
171 operation. Phase II planning is currently underway with a total of five runways (Zhang, 2014; ArchDaily,

172 2017). Al Maktoum International will not only create the capacity to meet Dubai's needs for decades to  
173 come, but also provides a state-of-the-art facility that revolutionizes airport planning on a massive scale.



174  
175 **Fig.3** Dubai World Central  
176 Design  
177 Source: 12/  
178

**Fig. 4** Dubai World Central Airfield and Terminal

179 Based on a publicized video, "Dubai World Central" is being publicized as a business and  
180 transportation hub with land and regional infrastructure developments designated for residential,  
181 leisure, and commercial districts. The airport will elevate Dubai as the leading economic engine for the  
182 region (ArchDaily, 2017).

### 183 **7 Development of the Istanbul new airport**

184 Istanbul is the largest city in Turkey. It is the gateway between Europe and Asia. It has a total population  
185 of 13 million. Its international airport, Atatürk Airport, is within the city and is currently the third busiest  
186 airport in Europe.

187 Like many major airports, Ataturk Airport is severely constrained for expansion due to its urban  
188 development. Without possibility of adding a new runway, the airport is facing an increasing problem of  
189 congestion. Turkish Airlines, the nation's flag carrier, is unable to add new routes due to the lack of slots  
190 and parking spaces. At present, the Turkish Airspace Authority does not allow additional cargo or  
191 charter flights to the airport due to its limited capacity.

192 Turkey's other existing airport, Sabiha Gökçen Airport, has an annual traffic growth rates of over 20%  
193 since 2013. In 2015, it handles 28 million passengers out of a maximum design capacity of 25 million.  
194 The two Istanbul airports together handle some 90 million passengers between 2015 and 2016.



195 Turkey is constructing its third international airport at a global mega scale by the coast of the Black  
196 Sea. The new airport, built on the European side of Istanbul, is on a 7,659-hectare region near Lake  
197 Terkos. The distance between the new airport and Atatürk Airport is approximately 35 km (22 mi). The  
198 airport is tentatively named Istanbul New Airport. Turkey claims it to be the world's largest. The airport is  
199 expected to handle 90 to 150 million passengers. Atatürk Airport will be closed once the new airport is in  
200 operation. As of December 2016, 40% of the construction of the airport was completed (DWC, 2017).

## 201 **8 The characteristics of Istanbul new airport**

202 Istanbul Atatürk Airport is already the third largest airport in Europe, serving approximately 60 million  
203 passengers. In 2013, the new airport construction plan calls for a 17-year contract for operation in 2030.  
204 The project is made up of four construction phases with a total cost €7 billion. The first phase started in  
205 2014. It consisted of three independent runways, eight parallel taxiways, a main 90 million-capacity  
206 terminal and two satellite terminals. The airport will feature a total of 88 aircraft bridges, a  
207 12,000-parking garage, cargo and general aviation and other related facilities including hospitals,  
208 convention center, prayer rooms, and a 312-foot-high air traffic control tower. Completion is expected by  
209 2018 with rail lines linking to Istanbul Metro. Upon Phase I completion in 2018, the airport will feature  
210 high-tech and aesthetically designed terminals with grand plaza entrances, glass walls, massive  
211 concourses, high vaulted ceilings, natural light and the most advanced security. The new airport will  
212 have easy access to existing rail, metro and bus routes.

213 The second phase will include one additional runway and other associated facilities. The third phase  
214 will include an additional runway and a terminal with a capacity of 30 million passengers. The final phase  
215 will include an additional runway, a terminal with a capacity of 30 million passengers.

216



217  
218 **Fig. 5** Turkey New Airport Design  
219 Source: 17/  
220



221 **Fig. 6** Turkey New Airport Terminal Designs  
222 Source: 17/

221 Atatürk Airport will be closed once Istanbul New Airport is operational. Its massive terminal concourse  
222 claims to be the largest in the world. When all phases are completed, the airport could be one of the  
223 biggest airports in the world capable of handling 150 million or more passengers. Upon full completion  
224 by 2030, the new airport will feature six runways, four terminals and rail access between terminals.  
225 There will be 165 aircraft passenger bridges, 500 aircraft parking, a state palace, Indoor/outdoor parking  
226 for 70,000 cars plus an aviation medical center. Aircraft rescue and firefighting stations, hotels,  
227 convention centers, power plant, and water treatment and waste facilities will be part of this massive but  
228 integrated airport system. The airport will feature eight newly designed air traffic control towers  
229 (Wikipedia, 2017; Propertyturkey, 2017; Franklin, 2014; Airport-Technology, 2017; Dailymail, 2017;  
230 Harress, 2014).

## 231 **9 The New Manila international airport**

232 For the last several years, there has been news about building a new second Manila International Airport.  
233 Congestion has long been an issue at the current Manila Ninoy Aquino International Airport (NAIA). The  
234 airport is currently handling about 36 million passengers a year, well exceeded its design capacity of 31  
235 million. (Propertyturkey, 2017).

236 According to the keynote address at the Routes Asia Strategy Summit in Manila, Joseph Abaya,  
237 Secretary of the Department of Transportation and Communication, a feasibility study on the project is  
238 currently underway with several proposed locations. One has been identified as Sangley Point, Cavite.  
239 San Miguel Corporation, a Philippines conglomerate is looking to build an airport at Bulakan in Budacan.

240 The conglomerate has submitted a plan to the Department of Transportation with a \$700 billion-peso  
241 (US\$13b) for a six-runway proposal in a 2,500-hectare property in Bulacan Province. President Ramon  
242 Ang said in a phone interview indicating that the airport will be built without any guarantee or a subsidy  
243 from the government. (Gazette, 2016; ABS-CBN, 2016; Youtube, 2017).

244 According to Mr. Edmundo Lin, the Vice Chairman of All Asia Resources and Reclamation  
245 Corporation, quote, “The best option is to replace the airport since there is no place to put the new  
246 runway to order to satisfy the national aviation standards” unquote. According to the latest information,  
247 the Department of Transportation and Communications (DOTC) has finally chosen Sangley Point in  
248 Cavite City as the location of the new airport, virtually shelving a similar proposal to build on reclaimed  
249 land in Manila Bay (Toh, 2016).

250



251  
252 **Fig. 7** New Manila International Transportation Hub      **Fig. 8** New Manila International Preliminary  
253 Layout  
254 (Source: <https://www.youtube.com/watch?v=Bblak49HvtE>)  
255

## 256 10 Characteristics of the New Manila International Airport

257 Construction of the new airport is to be built on reclaimed land. The new airport will be located within  
258 20km from the city's business centre with two pairs of dual runways and a proposed option of adding two  
259 more runways in the future. The following offers a glimpse of the new airport project.

- 260 • The project involves 2,500 hectares of reclaimed area off Sangley Point
- 261 • The project will comprise of three aspects: an airport, a seaport, and a special economic zone in  
262 between.
- 263 • Total passenger capacity is expected to be 100 million passengers a year

- 264       • The entire project will be a mega transportation hub with connections to the capital by  
265           expressways, bridges, or underwater tunnels.

## 266   **11 Issues and Observations**

267   Any major infrastructure planning projects are bound to be controversial. NGMAs are no exceptions.  
268   Skeptics and opponents would likely query the feasibility of building NGMAs. For example, are bigger  
269   airports always better? Does it make more sense to increase the capacity of several regional airports so  
270   that the total capacity can be equivalent to a NGMA...etc.?

271       A more simplistic answer to these questions is “not necessarily.” This paper does not advocate, nor  
272   imply, in any way the notion that “bigger airports are always better.” The bigger the airport, the more  
273   complex the system is going to be. NGMAs appear to emerge as a trend, a phenomenon, rather than a  
274   “one-size-fits-all” airport planning solution. “Expanding the capacities of regional airports” may be a  
275   legitimate one. However, the answer essentially depends on a “case-by-case” bases. More in-depth  
276   analyses of each individual case would be warranted in order to draw conclusions.

## 277   **12 Impacts of NGMAs on future airport planning**

278   NGMA is a new airport planning phenomenon in recent years. The objective of this paper is to  
279   demonstrate a new emerging trend in the field of airport planning in Asia and in the Middle East where  
280   some countries are capable of implementing a viable long-term solution toward aiming for airport  
281   dominance and leadership in airport development, given various favorable conditions politically,  
282   economically, and technically.

283       It is also apparent that NGMAs are more driven by the nation’s needs, political decision, objectives,  
284   resources and capabilities. The following observations are also evident:

- 285       1) **A trend of not only going “big” but global:** NGMAs are gigantic airports. The ability to  
286           process 100 to 200 million passengers per year seems to be the scale (norm?). These NGMAs  
287           are global, adaptable and self-sustaining airport cities aiming for the long term.
- 288       2) **Multi-parallel, all-weather simultaneous airfield designs:** Based on preliminary reports,  
289           NGMAs are designed with multiple parallel runway configurations aiming to process large

290 volumes of hourly flight operations under all-weather conditions. These airports are planned  
291 with at least 6 to 8 parallel runways in phases. The airfield design concepts of Beijing Daxing  
292 International, for example, are to be able to cater all-weather simultaneous independent parallel  
293 runway operations aiming to yield high capacity, highly efficient hourly operation.

294 3) **NGMA terminals are massive, high-tech and multi-faceted:** NGMA terminals not only are  
295 planned to be the world's largest, but are also designed as self-sustained mega-airport-city.  
296 They are high-tech, spacious, and integrated with sophisticated auto-functions for security  
297 processing, baggage handling, and customs formalities catered for both domestic and  
298 international travels. Terminals are artistically designed, architecturally constructed, and  
299 self-sustaining airport cities.

300 4) **NGMAs are mega multimodal transportation hubs and logistics centers:** NGMAs are no  
301 longer "airports" per se, but are highly integrated mega transportation system hubs, combining  
302 all available modes of transportation. They range from multi-level concourses to inter-terminal  
303 rail transfers; from metro link to high-speed rail intercity connections; from regional logistic  
304 centers to ocean-freight container terminals; and from regional distribution centers to free trade  
305 zones, all integrated into one self-sustaining transportation system for long term global  
306 dominance.

307 5) **NGMAs are high-tech:** The next generation of air transportation (NextGEN) will soon be a  
308 reality. The so-called "bandage approach" to upgrading existing airport systems would become  
309 obsolete and cost-ineffective. NGMAs are brand new mega high-tech airports aimed to  
310 revolutionize the airport industry.

311 6) **Global dominance and national prestige:** NGMAs are symbols of national prestige aimed to  
312 achieve global airport leadership.

313 From 2020 onward, the world is going to see a very different "class" of airports. Welcome to the next  
314 generation of airports.

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