

Executive Summary

Man has long had the desire to fly "like a bird", going from where he is to where he wanted to be without being inhibited by obstacles such as mountains, buildings, oceans, etc.

By the early 1900's, flight was becoming a reality, but not flight "like a bird." A lack of adequate light weight power to provide vertical takeoff and landing required man to settle for an alternative, the fixed-wing airplane. The fixed-wing aircraft brought with it the requirement for a runway for landing and takeoff leading to development of the airport with its growing size and facilities. Since the number airports and urban population grew together, there was soon a problem in siting both, thus resulting in a shortage of airports, or more exactly, the required runways.

The capability for point to point travel provided by the horse, and later the omnipresent automobile, had to be given up for the inconvenience of the urban mono-modal transportation facility, where surface transport and its associated congestion provided access to the air facility with its inherent congestion. It was much the same for railroad stations and seaports.

The technology generated by the demands of World War II provided the efficient airplane with advancements in greater performance, size, speed, altitude capability and endurance.

By the early 1950's, the availability of surplus and new aircraft, the use of radar (radio detection and ranging) for safe and efficient air traffic control, and the advent of the turbine engine made the airplane the preferred mode of transportation for passengers and cargo worldwide. The public acceptance of the sleek and faster jets as a safe and efficient means of transportation, added romance to air transportation and fueled the explosion of the air transport age throughout the world.

But in the 1940's, vertical flight was becoming a reality with the arrival on the scene of the first efficient helicopters. Yet the accomplishments of these early helicopters were greatly overshadowed by the public's acceptance and the rapid growth of the fixed-wing industry.

These helicopters were slow, looked ungainly, were noisy, and did not fly as high or as fast as any fixed-wing aircraft! Even with the extensive and effective use by the military in the Korean War and the "helicopter war" in Viet Nam did not gain helicopters the public acceptance warranted. They still were not as accepted as airplanes.

In many cases, the helicopter's image was tarnished by being envisioned as a costly and complex "military-only" and an industrial application aircraft, or as a luxury, only affordable by the affluent.

While helicopters were growing in size and capability, the air traffic control system was being optimized for, based on the speed, maneuverability and altitude requirements of, fixed-wing aircraft. Long, shallow-angle instrument approaches and missed approaches were designed to provide adequate safety for fixed-wing aircraft with one engine inoperative. ATC procedures were designed to accommodate the turning radii, speeds and climb/descent capabilities of fixed-wing. Essentially, the ATC system failed to allow for the performance capability and associated dispatch reliability that modern vertical flight aircraft provide.

As we proceed into the 21st century, we find vertical flight aircraft of a greatly enhanced capability. These advanced vertical flight aircraft, can perform point to point flights under all weather conditions with speeds approaching the nominal fixed-wing speeds of 300 knots, with a maximum endurance capability of over five hours, enabling them to cover distances of one thousand miles or more at altitudes of 25,000 feet or better.

These new vertical flight aircraft, such as the tiltrotor - an aircraft that is a high performance fixed-wing aircraft with the unique capability that permits vertical takeoff and landing - or any powered-lift vehicle can safely and expeditiously carry up to 100 passengers in fixed-wing comfort, at fixed-wing speeds over fixed-wing distances. Yet it does not require sequencing with fixed-wing traffic, and does not require a runway, thus removing the primary cause of air traffic delay - runway occupancy time.

Yet public acceptance lags... Why?

- They are perceived as a noisy and unfriendly neighbor, caused in part by an ATC system that forced vertical flight aircraft to operate at altitudes lower than optimal to avoid the flow of the less-maneuverable fixed-wing traffic.
- They are envisioned as unsafe, possibly by operating at the lower altitudes and possibly by memory of the very few public mishaps of the past. Vertical flight aircraft are inherently *more safe*, since they do not require a runway to land, only a relatively small obstacle-free area.
- They are perceived as expensive to purchase and operate. True, they may be more expensive than some fixed-wing aircraft, but provide utility far in excess of the fixed-wing assets when permitted to operate in a simultaneous and non-interfering ATC system, complementary to fixed-wing traffic.
- They are perceived as only able to operate in good weather. Not so! Modern advanced vertical flight aircraft possess the full capability of their fixed-wing brethren, with every system available to airplanes, including flight management systems and de/anti-icing capability, as well as weather radar and collision and terrain avoidance systems.

By utilizing the advanced vertical flight aircraft, in a system that provides simultaneous and non-interfering operations (SNI) thus removing the vertical flight aircraft from the flow of fixed-wing traffic, safer and more expeditions handling of all traffic can occur. We can provide fast, safe and timely transportation of passengers, directly from origin and to destination as well as feed to airports easily within 300 nautical miles.

By removing vertical flight-capable aircraft as well as smaller regional fixed-wing aircraft from the arrival/departure streams on the large runways, we can actually reduce delay by permitting closer sequencing for the larger, faster, fixed-wing carriers. Those same passengers will arrive via vertical flight. Replacing a smaller regional aircraft in precious runway occupancy "slots" with a larger aircraft increases capacity while simultaneously reducing delay. Vertical flight aircraft "pick up the slack" in the system and provide additional passenger seating. Measurable data indicate that a 40% increase in passenger throughput capacity can be gained in this manner.

The new capability provided by the GPS systems, ADS-B and upgraded flight management systems have enabled a new age in aviation, not seen since the advent of radar - the Simultaneous and Non-Interfering IFR system or SNI.

Vertical flight and SNI provide a capability not available before, a capability to safely and expeditiously transport passengers and cargo to sites either on or off airports, in all weather operations, using a system of GPS-based airways and performance-based (based on the using aircraft aerodynamic performance) procedures.

From this study, we examine the advanced aircraft. We determine what the operators and users need. We address the capability of the current ATC system and what needs to be changed. We investigate the public's perceptions of vertical flight, and what needs to be changed.

When the report is complete, we have addressed in detail the advanced aircraft, the operational requirements around which to build a new, efficient ATC system, and we know what we need to address in changing the public's perceptions. It will take a concerted effort by industry, the government and the public - it's the passengers need to travel that drives the industry — the need to "get somewhere" in a timely, efficient, cost-effective and *safe* manner.

What remains to be done?

1. A review by appropriate government agencies to provide acceptance and consolidation of recommended efforts to achieve the stated goals of reducing aviation congestion/delay and increasing passenger access and throughput through the judicious and site-specific implementation of GPS and SNI.
2. Provide a detailed plan of execution with appropriate time lines and task assignments, with accountability through the appropriate agencies.
3. Establish secure funding in appropriate categories, to be submitted in budget cycles, for the appropriate agencies/industry cooperatives to accomplish the requirements/goals in a timely and efficient manner.