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# **Drone in Libraries for Document Delivery: “Flying Documents”**

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## **Abstract**

From the internet to electrical vehicles, we all are the witness of the golden era of technological advancement. Drones or Unmanned Aerial vehicles (UAV) are also one of the growing contributions of this technological era. Earlier drones were used only for military operations but later some multinational companies or organizations have started to use it for delivering their parcel to their customer for commercial purpose. Libraries are always competing with the changing technology by adopting different technological tools. Drone technology is also among the emerging technologies, which can be used in a library for document delivery and some of the libraries have already started to use it especially during the time of pandemic. This paper will focus on the steps to be followed for implementing library drone delivery services, pre-requisites for implementation, payload capacity of drones etc. It will also give the overview of the present status of library drone delivery service.

**Keywords: Drone, Unmanned Aerial Vehicles (UAV), Library Services, Document Delivery Service, Flying Books, Flying documents, Drone Regulations, Libraries, Drone Technology**

## **1. Introduction**

Libraries are growing organism by physically or digitally. According to the fifth law of library science, “The libraries are growing organism” which denotes it should be updated over time. With the tremendous changes of ICT, Libraries have boosted their services by adopting different technological tools or aids. This era is the witness of tremendous changes in information communication and technology and all the fields are trying to cope up with this new environment by adopting different technology. Libraries are also not lagging behind, as it is always competing with the changing environment. There are so many new technological tools, which are adopted by different library of the entire world for different library functions. Drone technology also one of those. Initially drones were used only for

military purpose and these were very much expensive. However, now drone is inexpensive as well as accessible and it is continuously evolving in different novel uses by different individuals or organizations around the world like service delivery/shipping, filming/aerial photography, disaster management, geographic mapping, weather forecast, monitoring wildlife, crops etc. Since drone technology has found its way in different non-military uses, it can be used in library also for document delivery service.

## **2. Previous Studies**

At present, the applications of drones are visible in almost all the fields like in research, artistic production, news coverage, entertainment etc. Therefore, a large number of researches are going on in this specific area i.e. in drone technology, its application in different fields etc.

**Chingath and H (2020)** discussed the different applications of the drone technology to support library service. The authors also discussed how this technology could be adopted in a library. They stated that, many of the libraries of entire world has implemented drone for document delivery service but India is still lagging behind in this field.

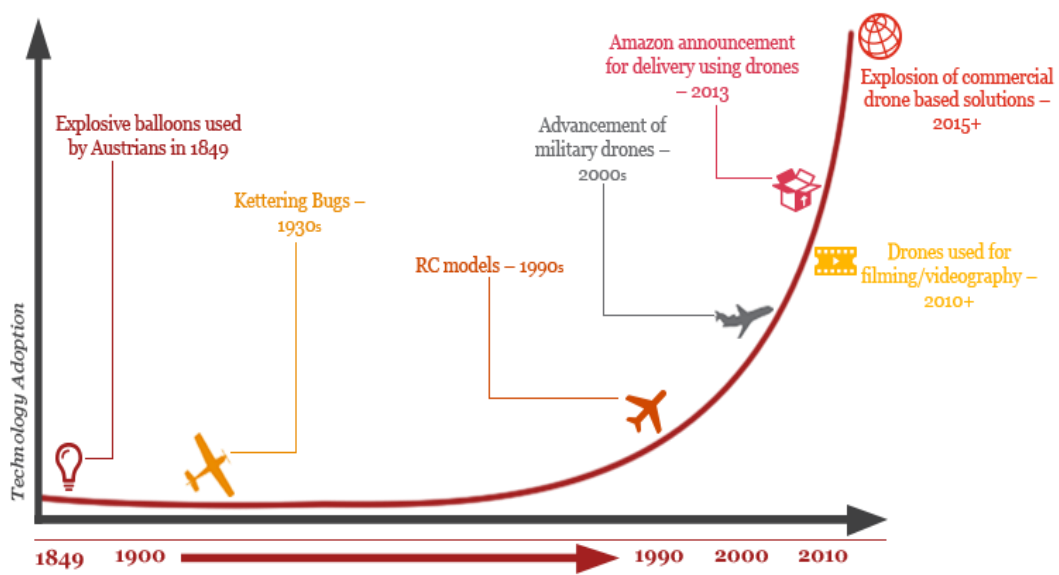
**American Librarian Association (2019)** discussed about the development of drone technology in the various field. ALA (2019) also described the importance of drone in library to support the library activities.

**Joiner (2017)** in her article “Is there a drone in your library’s future?” discussed how drones are providing numerous opportunities in the library environment. She also stated that libraries can collaborate with different companies or organizations that can manufacture or supply drones for the library. She also mentioned about various libraries that are providing demonstration and imparting knowledge on new technology for the library.

**Nath (2018)** stated that the delivery feature of drone can prove immense potential in bringing information to the library users in the form of books or other documents. In the article, he also discussed on various elements like drone facility, the integration of such a facility in the library, the procedure of processing user requests via drone delivery, the advantages and limitations of using drone delivery service etc.

### 3. Drone

The word drone has different meanings and it originates from the old English word “dran” which meaning is “male bee”. In technological terms, drones are unpiloted aircraft or spacecraft that can fly autonomously or by remote control on the ground. It is formally known as Unmanned Aerial Vehicles (UAV) or Unmanned Aircraft System (UAS). Unmanned aircrafts are made of some composite materials that can increase the maneuverability while flying and reduce the weight. These are equipped with different state of the art technology including infrared camera, laser, GPS (Global Positioning System), navigator, sensor, different drone hardware and software etc. Drone is a kind of flying robot and these are controlled by remote ground control system (GSC) and referred to as a ground cockpit. It works in conjunction with GPS and onboard sensors. Earlier these were used only for military purpose but at present, drones are used for different civilian purposes. **Figure 1** reflects the evolution of UAVs from the year 1849 as the very first year to plan a contraption that can fly on its own was 1849 and it was the year when Venice was fighting with Austria for its independence.



**Figure 2: Evolution of UAV**

(Source: <https://www.pwc.in/consulting/financial-services/fintech/fintech-insights/data-on-wings-a-close-look-at-drones-in-india.html>)

**3.1 Delivery Drone:** A delivery drone is also an important unpiloted aircraft, which is used for transportation of different materials like food, medicine, book etc to a designated area. These types of drones are having a basket or anchor to carry the goods. At present, drone delivery is one of the most exciting parts of technology. Many of the largest companies are investing a lot for its development. Health care sector is the early adopter of this technology. Wing Delivery drone, Condor Parcel Delivery Drone, flirtey Delivery drone are the top used delivery drones using by the largest companies of the world to deliver their parcels.



**Figure 2: Delivery Drone**

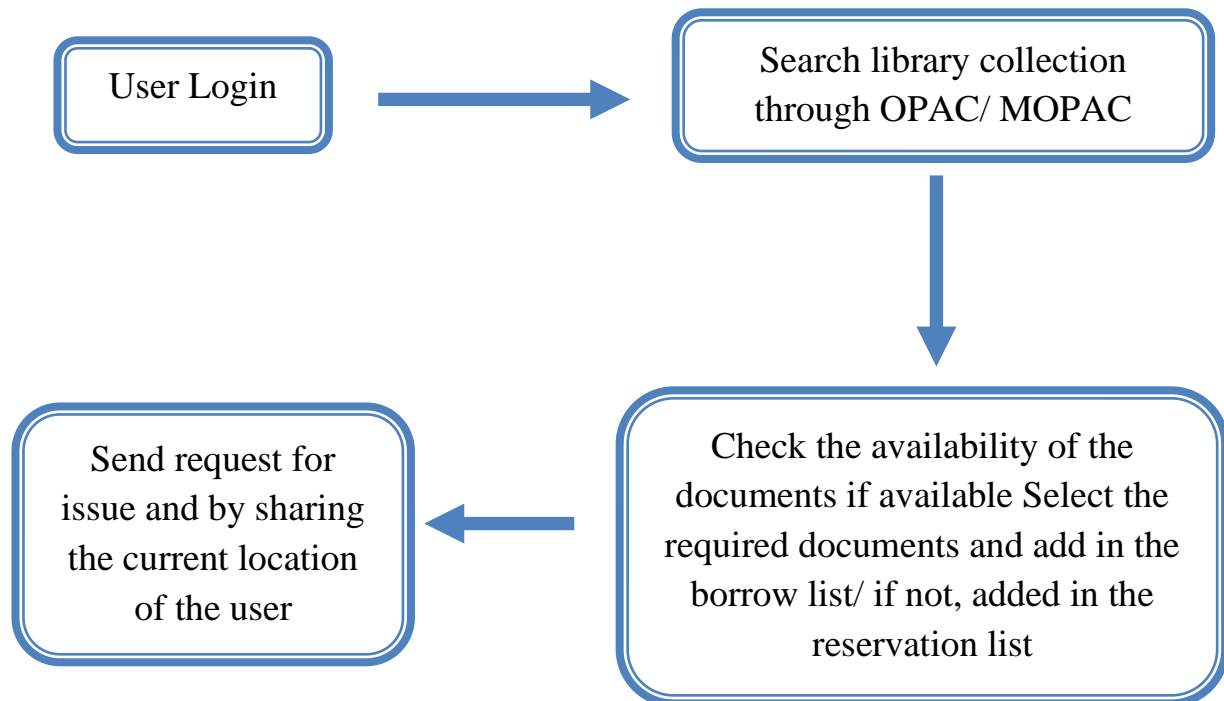
**3.2 Payload Capacity of Drones:** In terms of the world of drones, the maximum weight that can carry by a drone is expressed as “payload”. Drones are made or designed with a specific payload capacity to fulfill their main purposes for which it was designed. There are so many variables but the average carrying capacity of a drone is 0.3 to 2 kg whereas for professional or carrying drone it is 20 to 220 kg.

#### **4. Drone in Library Services**

Earlier drones were used only for military operation, but later different multinational company had started using it for commercial purpose. Mostly they used it for delivering their parcels to their customers. Similarly, in the library also drone can be used in the best way to provide the required documents to that type of users who are staying far away from the library or who cannot manage the time to visit the library for different reasons whether it is personal or official. Library drone deliver service can be the best way to provide the circulation service to its patrons during the time of epidemic like corona virus or COVID 19 etc.

For providing the drone delivery service by a library, the first and foremost requirement is library mobile app or a mobile friendly library website of that respective library. The library user will use the app or website to borrow documents from the library for which there must be the provision of user login as well as the option for sharing the user’s current location or address wherever he/she wants to receive the documents. The library user will search the library collection in MOPAC via mobile apps or in web-OPAC via the library website and

then they will select the documents required and set to borrow. The processes for sending request to the library by the library user via library app/ library website are shown in Figure 3.



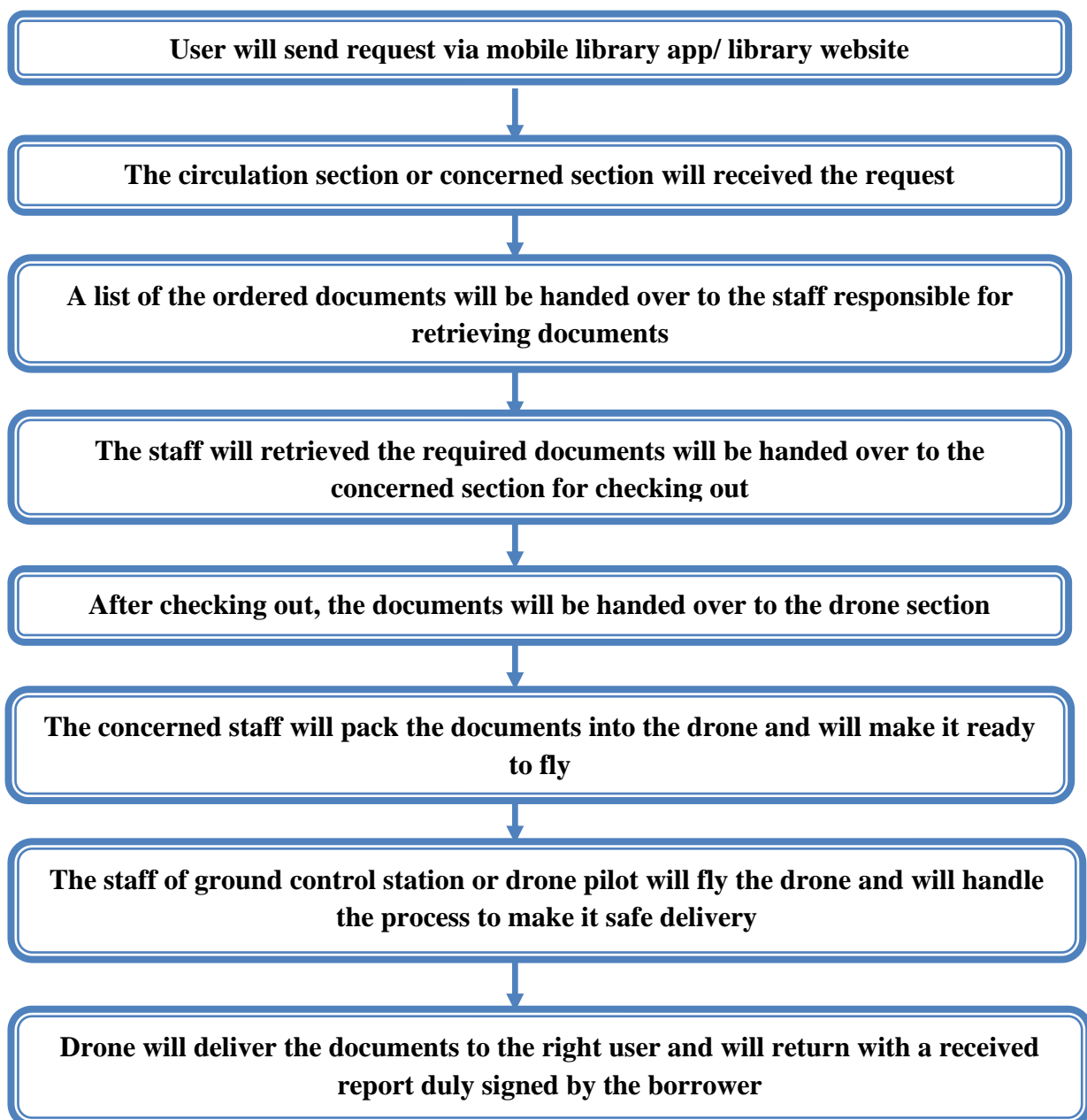
**Figure 3: A Step by Step Visualization of Sending Request via Library App/ Library Website**

There might be the requirement of a different circulation section for processing library drone delivery service, however, it will depend both on the technical knowledge of the library staff and the library works. For implementing the service, a group of skilled or trained professionals will be needed who can handle the overall process of document delivery via drone. The staff of the ground control station will be the responsible for flying the drone and making safe delivery to the right library user. There are two ways of using drone for delivering library documents to the library patrons:

**1) Deliver Documents to the Patron's Shared Address:** In this regard, the library patron will share the address where the required documents to be provided during the time of sending request via library app or website. The staff responsible for overall drone delivery process or the staffs of ground control station will remote control the drone to making safe delivery in the patron's shared address.

**2) Deliver Documents to the Patron's Current Location or Shared Location via GPS:** In this regard, the user will be required to on his/her GPS before the library starts the delivery process, for that a notification alert should get in patron's shared contact number or in the library app that he/she have to be switched on his/her GPS until the delivery process is completed. After connecting with the GPS of patron's device, delivery can be initiated via drone. However, point to be noted that the shared location should not be in that type of area where delivery can be problematic like traffic area, inside a running vehicle etc.

The processes for providing right documents or information to the right library user in the right time by the library drone delivery programme are as follows:



**Figure 4: Step by step Visualization of Document Delivery via Drone**

With the advancement of technology, the lifestyle of everyone has changed. At present, people do not want to waste their valuable time as everyone has a busy schedule. Library drone delivery programme can be the best way for both type of people who cannot manage his/her time to visit the library or who don't want to visit the library for borrowing a single book even for the people of special need. Library drone delivery service will fulfill all the five laws of library science enunciated by Dr. S.R. Ranganathan. Mostly the fourth law of Library Science i.e. "Save the time of the user", as the user will no longer be required to visit the library to borrow his/her book or document of interest, through this way the time of the user will be saved.

## **5. Best Practices of Library Drone Delivery Programme**

There are some essential points to be considered for the successful implementation of library drone delivery service. Those are as follows:

- ❖ Analyzing the importance of a drone in the library, "why it is important?" or "What are the advantages of implementing drone in the library?" etc.
- ❖ Analyzing the security as it can be hacked or stolen.
- ❖ Analyzing the storage of operational data and drone maintenance.
- ❖ Analyzing the site or airspace that the site or airspace will be suitable for flying the drone or not.
- ❖ Choosing the best drone for library document delivery service. After analyzing the other issues, there might be a question like "Which drone will be the best" for library document delivery service, its payload capacity, battery power, ability of avoiding collision and detecting obstacle etc.
- ❖ Testing the drone in different environment before implementing it for document delivery.

## **6. Prerequisites for Implementing Drone Delivery Service in the Library**

There are some prerequisites for implementing a drone in a library. Those are as follows:

- ❖ **Mobile Library App/ Mobile Friendly Library Website:** For providing the library drone delivery service, a library must have a mobile library app or mobile friendly library website through which the user will send request for the required documents.
- ❖ **Creating Awareness**  
The next step will be creating awareness among the library staff about the positive impact and advantages of adopting drone technology in a library for providing



document delivery services and it can be done by organizing or attending different capacity building programmes like workshops, seminars, meeting etc.

❖ **Documenting Requirement**

As drone have regulations in many countries, for flying a drone, documents like permission approval, agreement, insurance, license will be required.

❖ **Financial Requirement**

Adequate fund will be needed for acquiring different required things for starting the document delivery service through drone.

❖ **Positive Attitude of the Administration**

Positive attitude of the administration and authority is very much required. They should understand the positive impact of implementing a drone for library document delivery services.

❖ **Consultation with the Expert**

IT professional is also necessary for a user-friendly as well as perfect app. The trained and skilled professionals are needed for providing such kind of library services through mobile app.

❖ **Building Awareness Among the User**

Building awareness among the user is also a main factor after the implantation of a drone library document delivery service, since a new system is sometimes difficult to understand than the existing one. For that user orientation programme can be organized.

## 7. Limitations

Though the drone delivery is taking off around the world, there are some major barriers or limitations of it.

❖ **Drone Regulations:** As in many countries drones are having some regulations, and in some of the country, drones are banned.

❖ **Limited range and payload capacity:** Drones are limited in range and carrying capacity. Sometimes it cannot be reach to the user due to its specific range or sometimes for the extra weight of the documents to be delivered.

❖ **Technological issue:** Drones require an improvement in terms of battery to be effective. It has higher risk of failure or malfunctioning during the time of transportation or fall from the sky or accidentally the documents to be delivered will loss.

- ❖ **Meteorological issue:** Due to some weather issues like rain or strong wind, document delivery may delay.
- ❖ **Lack of fund:** For acquiring delivery drones for a library, a huge amount will be required as the delivery drones are expensive. Sometimes it can also be an unavoidable barrier in adopting drone technology in the library.
- ❖ **Lack of skilled professionals and patron's knowledge about drone technology** can be a major barrier of document delivery service via drone.
- ❖ **Risk of hacking:** There is a risk that the drone used for document delivery could be stolen or hacked.

## **8. International Drone Rules and Regulations**

The use of Unmanned Aerial Vehicles (UAVs) or Unmanned Aircraft System (UAS) or drone is generally regulated by the National Aviation Authority of many countries like Australia, Brazil, Canada, France, Hong Kong, India, Indonesia, Japan, Malaysia, Myanmar, The Philippines, Singapore, South Africa, South Korea, Thailand, United Kingdom, United States etc. However, there are some countries where drones are banned like Algeria, Barbados, Brunei, Cuba, Iran, Iraq, Kuwait, Syria, Uzbekistan etc. (<https://uavcoach.com/drone-bans/>)

## **8. Present Scenario of Drone Delivery in the Libraries**

Edmonton Public Library (EPL) of Canada launched four epl2go drones to deliver the library materials to the cardholders in 2019. Before delivering the materials, a text is delivered to the cardholder who request for the library materials. The text instructs the cardholders to clear all the pets from the area as the epl2go Air does not fly into or startle animals.

Different Libraries of the world like Dubai Public Library, New York Public Library, Arapahoe Libraries etc. have already started to use drone technology in their library service.

Kelly Passek, a school librarian of Montgomery County public schools, Christiansburg, Virginia adopted drone technology for library document delivery service during the time of Corona virus pandemic. She did not want to keep the students of her school away from the library books they love. Therefore, she decided to deliver the library books to the children's doorstep via drone for summer reading as she was already using Wing Aviation, a drone delivery service from Google's Alphabet to deliver the essential households items. She thought that if the drone can help in her personal life, then why not in her

professional life too. She wanted to connect with her students as remote learning was started due to corona virus. Then the idea came to her mind and started library document delivery via drone. The students of Montgomery County public schools, Christiansburg, Virginia can request any book from the library catalogue that includes over 150,000 titles by filling up one online form.

## **9. Conclusion**

Technology is growing very rapidly. Drone technology is also one of the most emerging technologies of today's world. Though it has different applications in non-military uses, but in case of library, it is still in infant stage. There are different advantages of adopting drone technology in library document delivery service as well as limitation. The day is not so far when we will see the sky full of drones flying to deliver the products of different commercial companies to their designated place.

Libraries or LIS professional are always competing with the new environment by adopting different technological tools to cope up with the new environment. Though the adoption of drone technology is a new concept or it is still in nascent stage, it has been started to use in different libraries like Dubai Public Library, New York Public Library etc. to deliver the library document to the patron's doorstep. This technology needs more improvement in library applications. The LIS professionals should take the main initiative to adopt this technology in the library services and make their user to understand about this new service and waiting for the day to when we will that library drones of our library are flying in the sky to deliver our library documents....way to go...

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