Digital Resources about Aviation History

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ABSTRACT: In this paper the author is trying to find out if there is any digital library of aviation history in general and describe digital resources in the field of aviation history. Both the world history of aviation and the history of aviation in Serbia are the subject of the research in the paper. Results of research carried out between April 2019 and November 2020 showed that digital library of aviation history of particular country or nation is not available. There are different resources, that is, web sites where various artifacts of aviation history can be found.
KEYWORDS: Aviation history, digital library, cultural heritage, metadata.

1 Introduction

The central topic of this paper are online resources with its main objective to nurture the history of aviation.[1] During the work on the topic, no similar researches or theoretical works in the field of digitization of aviation history were found, but a large number of network resources that are fully or partially, professionally or thematically determined for aviation history were found. While some of the resources present the history of aviation in the world, other resources present the history of domestic aviation or the history of aviation in a particular region. The paper "Digital Resources about Aviation History" is written for experts in the field of librarianship

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1. The text was written along with the creation of doctoral dissertation "Conditions for creation and initial records (material) of the digital library of the history of aviation in Serbia", the proposal submitted in 2019 at the Faculty of Philology, University of Belgrade.

and information sciences, as well as for the experts in aviation. The topic can be interesting to a wider audience as well as to traffic experts in general, enthusiasts and audience with an affinity for aviation. The target groups of readers in the field of aviation are the ones in education, lecturers and aviation professionals.

The need for a digital library of aviation history is confirmed by a multitude of different digital resources that contain one thing in common and that is (the nurturing of) the aviation tradition. In addition to the organization of aviation events, the digitization of various documents also contributes to nurturing the aviation tradition. Text documents, audio and video recordings, various visual materials are all digitized, and it can be assumed that computer programs for aviation purposes are stored in the same way, e.g., aircraft manufacturer program, airline software for flight simulators or airline commercial activity. The type and scope of material as well as the type of services depend on goals and the target group of users of such library. Publications containing aeronautical technical information, as well as photographs, drawings and notes that lean towards the social history of aviation have been digitized. There are digital resources from the history of aviation that exclusively digitize photographs, while others mostly digitize video recordings. In general, there are digital resources whose collections vary from posters, bookplates and postcards with motives from aviation. There are also digitized catalog sheets (bibliographic records)[2] related to aviation. It can be stated that generally, digital resources often contain information from aviation, but the success in searching is much greater if textual records are searchable by words from the text.

Unfortunately, no theoretical works have been found on the digitization of aviation history so far, that is, no theoretical works on the topic of digital libraries of aviation history or collections from aviation history. However, if the elements of the IFLA / UNESCO Manifesto for Digital Libraries are followed[3], they can point out the importance of digital resources or digital library of aviation history. Digital libraries have a "strategic role" in society by helping to organize and "disseminate information". Thus, digital sources of aviation history would preserve and present material that represents cultural and scientific heritage. The digital library of aviation history would represent, in a certain way, the systematized history of aviation and the organization of knowledge in that field. As a "collection of digital objects

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2. Retrospective catalog conversion.

3. All quotations in this paragraph are related to the Manifesto (IFLA/UNESCO 2012).

of certified quality" and "services necessary for finding and using" of digital sources, the digital library would provide systematized information in a "fast and cost-effective way". Information for researchers, lecturers and people in the educational process, as well as the general public (persons outside the aviation profession), who thus put aviation activities in a certain social context, in the case of our social reality, would raise awareness of the importance and comparability of Serbian aviation globally.

2 Digital sources of aviation history – the course of research

There are many resources in digital media that deal with the history of aviation in different ways. The research was conducted through the Google search engine, with different dynamics, from April 2019 to November 2021. Queries containing the following terms: AERO*, AERONAUTIC, AIR FORCE, AIR TRAFFIC, AIR TRANSPORT, AIR*, AVIATION HISTORY, AVIATION HISTORY AND DIGITAL LIBRARY, AVIATION MUSEUM, AVIATION, CIVIL AVIATION AUTHORITY, CIVIL AVIATION, DIGITAL LIBRARY, FLIGHT, FLYING, HISTORY, LIBRARY, MUSEUM and TRADITION were performed.

The research started with the queries AVIATION HISTORY and AVIATION HISTORY AND DIGITAL LIBRARY and provided many results which were not (arranged) in any order. Introduction of the terms AERO*, AERONAUTIC, AIR FORCE, AIR TRAFFIC, AIR TRANSPORT, AIR*, AVIATION MUSEUM, AVIATION, CIVIL AVIATION AUTHORITY, CIVIL AVIATION, DIGITAL LIBRARY, FLIGHT, FLYING, HISTORY, LIBRARY, MUSEUM and TRADITION also provided various results. Finally, the research was completed by introducing country parameters. The name of the country in English was combined with the terms AIR FORCE, CIVIL AVIATION AUTHORITY, AVIATION MUSEUM and DIGITAL LIBRARY.

The use of the last of those methodologies mentioned before, provided the best results. However, the search according to that principle could not be fully applied to all states, i.e. the territories to which it referred. If there was no other way to get an answer, the search was performed according to the state parameter on various web pages (*Global security, Flickr, Flock Aero*)[4] that appeared in response during one of the previous attempts of research.

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4. More about *Global Security* and *Flock Aero*, in the text below; *Flickr* will not be described since it is general type resource.

In the end, a list of organizations, institutions or companies that present the history of aviation in electronic form in different ways was obtained.

3   Research results

Since the middle of the 1990s, there were websites that continued the previous tradition of nurturing the history of aviation. Textual recordings and photographs were most often in electronic form, but over time, recordings from other media were also included in the content. Today, the history of aviation is presented on the World Wide Web, originally preserved on two-dimensional and three-dimensional media, audio and video recordings, i. e., in the form of images, text, sound and video. The history of aviation in electronic form is also represented by individual items on the web pages of museums or libraries as well as web pages created exclusively for the purpose of presenting the history of aviation.

In this paper, some cases of network resources of the history of aviation are presented. They are presented by: name, territorial scope, i. e., history of domestic aviation, regional aviation or aviation in the world, as well as the ways of searching, ways of presenting search results, comments on the functionality of the site, registration conditions and opportunities provided by registration on the site if available or necessary.

The following web pages are listed alphabetically by country of origin[5] and the search results (digital objects) are described by metadata that vary in range (Тртовац 2017).

3.1   United Kingdom

The Heritage collection comes from the website of the Royal Aeronautical Society (Royal Aeronautical Society, n.a.). It contains 14 thematic collections and seven biographies of people who are the pioneers of the theory and practice of British aviation. Researchers and other visitors to the *Heritage Collection* are instructed on how to use the resource while respecting copyright. Special emphasis was placed on publishing photos, drawings and other digitized content from the site, which is not disputable if it refers to the resource, that is, to the *Heritage Collections* page. Searching is simple, by entering a query in the provided field. The access page shows the most

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5. Alphabetical order refers to the resources from all countries except Serbia whose resources will be described afterwards.

sought-after objects (Top Terms), systematized by terms (Taxonomy terms), i.e. metadata and the numbers of items marked. In other words, collections of photographs, drawings and notebooks, models of airplanes, constructions of airplanes, gliders and propulsion units are shown, as well as collections related to persons and sciences of importance to the history of the pioneering era of aviation. Each selected object contains metadata that relates to the digital document itself (Item Details) and to the Collection (Collection Details) to which it belongs. These are the following metadata: description, time, and often different terms (Taxonomy terms) - for each unit of digital library material (digital object), i.e., collection name, collection, description and terms (Collection Terms) - for a collection, where the metadata for the collection is always the same (since they describe the same collection). The site is clear and functional. There is a option for registration on the main page (website of the Company).

Aeroflight (Aeroflight, n.a.) is a site registered in June 1996, and since October 2019 this site also functions as *Aeroflight Cloud* (Aeroflight Cloud, n.a.), representing a space for collecting and disseminating information in the field of aviation. These are current information and information from history of aviation, related to air force, sport and civil aviation, museums, institutions and organizations, aircraft owners, etc. For the needs of the site but based on crowdsourcing activities, a database of monograph publications is created, primarily in English. These are publications with ISBNs that were published until 2000, regardless of the original form. The database was created in Microsoft Excel, and consists of three sheets: title, attribute definitions and attribute values. There is a great similarity between the metadata attributes that describe digital documents on the *Aeroflight* page and those in bibliographic databases that use some of the MARC formats. In addition to the database of monographs, there is also a database of serial publications. Regarding information retrieval, search results represent articles, lists, and links to other sites. At *Aeroflight*, you can also find content from the history of aviation in Serbia, under the designation Yugoslavia and Serbia. The page is loaded with various (and numerous) contents within the topic, but it kept its functionality. There is an option for registration on this page.

Flock Aero (FltCtrl Ltd, n.a.) is the world's largest airline services marketplace. For the paper, this page is interesting in terms of evidence of the existence of any sign of aviation in certain countries or territories (tab Countries at (FltCtrl Ltd, n.a.)), in cases if searching by metadata (terms such as AVIATION HISTORY AND DIGITAL LIBRARY or just AVIATION HISTORY) did

not provide satisfactory results. In other words, this page is interesting in the sense of civil aviation authorities.

Air Team Images was registered in 2003 (AirTeamImages, n.a.). Its initiator is also a reputable photographer, focused on aviation. *Air Team Images* is an online library of aircraft photographs, which is set up with the aim of providing the site visitor or client with the highest quality "aerial photography" ("About Us" at (AirTeamImages, n.a.)). Although the emphasis is on aircraft, this page contains photographs that refer to all aspects of aviation. In addition to photos, videos and texts can also be found on the website. A slide show consisting of fifty newly arrived photos, as well as a list and links to the items that the visitors of the page most often searched for (Popular Photo Searches) are shown at the Home page. The search is performed by metadata and can simply be carried out by entering a query in the Search field. Also, the search can be done by selecting the metadata attributes, from the available fields, if the Popular Photo Search option is selected. In that case, a large number of attributes are available. Some of them are: aircraft manufacturer, operator, country, photo theme, photo orientation, photographer, sorting and photo ID. The results of the query are often photos, marked with an ID number. If a photo is opened, there is a broader description.[6] In that case, photos are not only noticeable, but there's a detailed description given in the form (attributes and values) of numerous metadata: manufacturer, aircraft type and model, operator code, place or country, date the photo was taken, photo ID and annotation. The image link is below each digital document (in this case, a photograph). *Air Team Images* also contain material from the history of aviation in Serbia, that is, the aviation of Yugoslavia and Serbia. The site is clear and functional. There is an option for registration on the site.

3.2   Canada

Avialogs (Avialogs, n-a-) online community and library was registered in 2010 with the aim of preserving publications in the field of aviation and providing the widest audience with online access. For the needs of this library, monographic and serial publications in the field of aeronautical technology have been digitized. *Avialogs* operates in the form of several collections related to aircraft, powertrains, engines, equipment, parts, construction, manuals and serial publications. For now, the search is performed by metadata. A new released version of *Avialogs* will not include searching by words from

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6. All photographs are interactive locations.

text. However, the new version will include a complete transcript (software improvement),[7] drawings and diagrams, unlimited download for all users, whether they are legal entity (aviation facilities, museums, collectors) or person, and finally, a monthly plan. Speaking about monographic publications, digital documents are described by metadata that usually has only the following attributes: year of publication, number of pages, language of publication, type of publication and name of the source on the page where the object was published, that is, situated on *Avialogs*. If it is an object from the Aircraft Register collection, the documents are described by metadata with several attributes. These are: the name of the series, the designation of the series, the name of the factory in which the aircraft was manufactured, the name of the engine type, as well as the name of the source. Digital objects (publications) are fully accessible to registered visitors. Registered users (site visitors) can access entire publication, while others can view the first ten pages of the selected publication. Registered users also have the choice to read publications free of charge or with one of the available membership fees, gain the opportunity to edit, download or print the page. Before the step of "membership", i.e. subscription for use, each visitor has access to all digital objects. Users are not required to join as long as they do not need a particular publication. They may take a look which publications are available through this resource without any commitment. There are three publications in Serbian which are, in fact, manuals, about the use of some planes of the post-war Yugoslav aircraft factory Soko, which have also been digitized. The site is clear and functional.

3.3   Germany

Flugzeugbilder (Flugzeugbilder, n.a.) was registered in 2001. It represents aircraft photos; amateur photos and photos taken by professional photographers. The home page, which is in German can be switched to English user interface, while the French is under construction. The search is performed on metadata that has the following attributes:

– airline,
– airport,
– email,
– aircraft type,
– photo id,

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7. Author's note.

– photographer,
– comment,
– recording date,
– aircraft registration plate.

One can view 10, 15, 25 or 50 photos per page. The search can start or end with a certain term, perform with the exact term or by entering keywords. The search can be simple and combined. Search results give a list of objects. These are photographs of airplanes with attribute values: photo ID, number of views, date taken, photographer, operator, type of aircraft and its registration number, sorted by number or date of view, in ascending or descending order. Airport also appears among the attributes and is described by the three-letter and four-letter designation of the airport; location and name of the airport; the state. If a specific photo is selected, a larger view with the same metadata is obtained. *Flugzeugbilder* contains photos of the Serbian Air Force.[8] This website is clear and functional but also contains the optimal amount of metadata. The visitors of the site are also allowed to upload their photos. The instructions on the procedure can be found on the Home page. There is no registration on the site.

3.4 United States

The Aviation History Online Museum (Aviation History Online Museum 1996) is a resource of aviation history that offers textual, visual and audio-visual records. This online resource was launched in 1996, for educational purposes. The predecessor of this page is Aviation Models, a page dedicated to aircraft modeling, launched in 1995. On the Home page of the Aviation History Online Museum there is the content of the page grouped by areas: aircraft, engines, theory, aviation, modeling, World War I, pioneer era, videos, links to other pages and briefly about the page. Each area is described with several metadata. Aircraft engines have three attributes: the name of the manufacturer, the type of engine and the country of production. In the case of aircraft, there are attributes related to the manufacturer, type of aircraft, country of manufacture, text and color attributes; text and color have the values "yes" and "no". The content of the site is easy to understand, it is rich in metadata describing aviators, pioneering age and theory, while other topics are modestly described. *The Aviation History Online Museum*

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8. Query that retrieves data about Serbian aviation (accessed 17. 1. 2022).

page is the optimal source of information for aviation history and is very functional. There is neither search field nor registration on the site.

The Digital Collections of the WWII Museum (The National WWII Museum, n.a.) is website of the *World War II Museum* (WWII Museum), which was founded as an institution in 2003 in New Orleans.[9] This online resource contains photographs and testimonies (of World War II participants) in the form of video recordings of interviews. The search is simple and is performed by entering a query in the search field on the access page. Search is facilitated by metadata sorted by the branch of service and theater of operations criteria.[10] From the access page through the browser, one can find numerous metadata that make searching easier. They are sorted by service in the army, area of operation and terms (subject terms) from dictionaries related to a particular topic.[11] The terms from the dictionary are numerous, and the dictionary itself consists of hypertext connections, that is, the term and the number of objects to which the term refers. A term can be a single word or it can be a phrase. Using terms makes it easier to form queries. For example, two items are scored on the term friendships, data type video: (1) the *Dabney Montgomery's video* (part of *Early Life*) and (2) the *Donald Wilson's video* (*The Naval Battle of Guadalcanal*). Each object contains a document and metadata. In the first case, attribute values are Dabney Montgomery and Early Life. Also, an extensive annotation was made. Descriptive terms are Personal / family relationships, Prewar life, Experience with death, Great Depression, Race relations, Ethnic / racial identity, Education, Reaction to Pearl Harbor, Enlistment and Friendships. *The Digital Collections of the WWII Museum* also contain records relating to the history of the Yugoslav Air Force.[12] *The Digital Collections of the WWII Museum* site is quite simple, well organized and very useful. There is also the possibility of registration

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9. Originated from The D-Day museum founded 2000; intended to commemorate American veterans, that is, participants in the Battle of Normandy More details on the origins of these institutions (accessed 13. 1. 2022).

10. Following terms: *US Army Air Forces*, *US Navy*, *US Army*, *US Marine Corps* and *Civilian US Merchant Marine* are metadata attributes referred to service, while terms: *China Burma India Theater* (CBI), *Pacific Theater of Operations* (PTO), *Atlantic Theater of Operations* (ATO), *European Theater of Operations* (ETO), *Mediterranean Theater of Operations* (MTO) and *Home Front* are metadata atributes refered to zone of action. Available (accessed 11. 1. 2022)

11. Browsing page (accessed 7. 2. 2022)

12. Eben Smith – Final mission and capture, Luke McLaurine – Loss of aircraft and capture (accessed 13. 1. 2022)

on the page, which, judging by the values from the available list, is intended for the citizens of the United States of America.[13]

Flight Journal (Flight Journal, n.a.), an aviation magazine, was launched in Ridgefield in the 1990s in a classic form (ISSN 1095-1075) and at the beginning of the next decade it acquired its online edition. Flight Journal presents the history of aviation from the pilot's perspective: "we put readers in the cockpit". The basic metadata of the page are: Air Force, Civil Aviation, News and Stories (various events and topics; restoration, personalities) and the directory of the United States Air Force Museum, in alphabetical order, from A to W (Alabama - Wyoming). On the website one can also find items from the history of aviation in Serbia, presented in the form of an article.[14] The publication offers the possibility of subscription and registration.

Global Security (Global Security, n.a.) is a continuous online resource, in fact, a serial publication (ISSN 2769-8947), registered in 2000. It covers security issues (on the planet and extraterrestrial space), that is, issues of military and intelligence nature. Global Security broadcast news is updated every hour.[15] A search on the page can be performed from the access page, by selecting the country or territory, or entering a query in the search field. One of the metadata for countries is aviation. The basic metadata on *Global Security* are: land forces, warships, airplanes, missiles, laser technology, intelligence, space; war zones; para-military forces. This page is not relevant to the history of aviation but was the only source on the existence of aviation in the case of individual states or territories.

The Aviation History Collection - Selections from the George Hardie Collection, of the University of Wisconsin (UWM Libraries Digital Collections, n.a.) was digitized in 2006. It consists of ten titles from the collection mentioned above, that is, digitized pages of publications related to aviation, in the period from 1865 to 1930.[16] Digitization has been carried out in this institution since 2001,[17] which enables remote access to library and information materials. In the year 2022, the material that includes over seventy collections has been digitized. There is a basic and advanced search on the page. The search results are described by the following attributes: title, author, year, title of the publication, annotation, subject matter, type of content, place of publication, name of publisher, medium, notes, scope of publica-

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13. The registration page (accessed 13. 1. 2022)

14. On This Day in Aviation History (accessed 17. 1. 2022)

15. Company History (accessed 18. 1. 2022)

16. Keyword search (accessed 11. 1. 2022)

17. About UWM Libraries Digital Collections (accessed 18. 1. 2022)

tion, language, donor, year of digitization, format as well as other elements. Each page of the digitized publication is also described by its own title, year, publication title, copyright and collection name. Unfortunately, this well and easily organized page does not contain data from the history of aviation in Serbia.[18] There is no registration on the site.

The Latin American Aviation Historical Society (LAAHS) was founded in 1997 and registered in Miami as a non-profit organization (The Latin American Aviation Historical Society, n.a.). It displays various textual and visual forms: articles, columns, reviews, Facebook forums related to the history of Latin American aviation and is the only tool the Society uses to publish, preserve and disseminate the research results of its members.[19] In addition to the articles, the Home page also contains information about the Society, instructions for authors, donors and site visitors, as well as search fields. The search is basic and is performed by entering a query in the field provided for this type of search. In addition to the basic search, there is also a search that is performed by the criteria of the category of articles (article, column, review). Text and images are accompanied by labels. Within the (Categories, Articles) entry point, articles are grouped into *Caribbean Aviation*, *Central American Aviation*, *General Latin America Aviation*, *Mexican Aviation* and *South American Aviation*. There is also an archive of articles on the pages covering the period 2018-2021 and the search is performed by selecting the month of a particular year. Talking about the category of Latin American aviation, the Latin American air force is divided by the territorial principle. The forum on the page is restricted and intended only for members of the group (on the social network Facebook). There is no registration on this page.

Historynet, LLC, founded in 2015,[20] as the largest publisher of history magazines, published the magazine *Aviation History* (HistoryNet, n.a.), and provides among other things daily information and a photo gallery on the site. A search on a page is basic, by entering a topic, event, time period or place in the search box. One of the responses to the query SERBIA AND AVIATION HISTORY was an article with a title *F-117A: The Black Jet.*[21] Articles are not accompanied by metadata or labels. Metadata for aviation history on *Historynet* are: aviation history magazine, aviation history, Mag. Aviation

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18. Queries SERBIAN AND AVIATION and YUGOSLAVIA AND AVIATION returned no match.

19. About LAAHS (accessed 19. 1. 2022)

20. Historynet (accessed 18. 1. 2022)

21. F-117A: The Black Jet (accessed 14. 2. 2022).

History Aircraft, Mag. Aviation History Featured, Mag. Aviation History Hero, Mag. Aviation History Modeling, Mag. Aviation History Mystery and Mag. Aviation History Personalities. There is no registration on the site but there is a subscription option.

3.5   Netherlands

Aviation News (Aviation News, n.a.) is a website, launched in 2006 in the Netherlands, which provides the latest aviation news in general. Following websites originate from the *Aviation News*: *Aviation Museum database*, *Airshow reports* and the unofficial *Paris Airshow website*.[22] These are online resources that are focused both on the contemporary and the history of aviation. The most relevant for this paper is Aviation Museum website. It covers Africa, Asia, Europe, Latin America, the Middle East, North America and Oceania. There is also a sitemap; a list of hypertext links to each country that is relevant to this page. Each of the countries on the list can also be represented by a new list (of museums' or aviation institutions' website). If the request is SERBIA, the response is the "Aviation Museum" in Belgrade, "Soko Jastreb" and "Mig-21" (two military planes located in the yard of the Aviation Academy in Belgrade). For all three *Aviation News* websites, the search is simple and performed in the same way. It is supposed to enter a query in the search field and get an answer. The response is presented in the form of text and images, and in most cases with a link to other pages and labels and therefore a large number of attachments can impair the visibility and functionality of the site. There is no registration on the site, but there is a subscription to the newsletter and contact form.

3.6   Network sources in Serbia

Digitalna NBS (Digital National Library of Serbia, hereinafter *Digital NLS*)[23] is an online resource of the National Library of Serbia which began digitization in 2004 (Butigan-Vučaj 2003). The search is performed on the basis of metadata and on the basis of words from the text. One can make thorough examination using advanced search which is performed by assigning values to metadata attributes such as: title, author, topic and identifier. It is also possible to enter the name of publisher, place of publication, year

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22. Aviation museum, Airshow reports, Paris Airshow / (accessed 13. 1. 2022.)

23. Previous version of Digital NLS, available on (Narodna biblioteka Srbije, n.a.).

or range of years relevant to the search and select the language in which the publication was published, select the type of library material (monographic publications, serial publications, articles or other components of the publication, sound recordings, cartographic material, music material, pictorial material, manuscript book and manuscript material) or enter value of attributes in "name and surname of the collection owner". Finally, search can be performed by words from the text, which are introduced later and is much better solution that contributes to the quality of the digital library. *Digital NLS* contains digitized publications and non-book library and information material in the field of aviation. On the *Digital NLS*, you can also find photos where you can see, for example, the announcement of the upcoming air rally. The document is accompanied by a simple description, with only two attributes. These are the title and identification number of the record in the bibliographic-catalog database COBISS.SR or COBISS.SR-ID, that is, the values of the two attributes. Attribute values, for example, may be: Belgrade, Terazije, Terazié, or 95356428.[24] ID 95356428 refers to a bibliographic record that provides a broader description using the following attributes: comparative title, language, type of material, year, issue and production, physical description, notes, subject terms, UDC number, link and abstract. Digitized monographic publications are associated with several attributes: title, subject, author, publisher or printing agency, date, language and COBISS.SR-ID. A more detailed metadata view contains the following attributes: title translation, scope, format, and spatial determinant. The document is accompanied by the attribute: Collection, with the value: Books, which means that it is a collection of digitized monographic publications. In addition, digitized domestic newspapers are potential source on the history of aviation. A significant number of articles on aviation can be found in searchable newspapers, for example, in *Политика* (Politika) (Injac 2006).[25] Thus, important events for the aviation were covered. For the purposes of the paper, only some of them will be listed: the crash of the Merćep-Rusjan plane near the Kalemegdan fortress (Belgrade) on the third day of Christmas in 1910,[26] than, the first registered plane crash in civil aviation which occurred on the Paris-London route on April 7th, 1922 and the first domestic aviation exhibition, held in Belgrade in 1925, as well as the first international aviation exhibition

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24. There are many photos of Yugoslav Airforce on Digital NLS. They are available on: Balkan war 1912-1913. 1/25, Balkan war 1912-1913. 1/27, Balkan war 1912-1913. 1/28, History of Yugoslav Aiation (accessed 15. 1. 2022).

25. Politika (accessed 15. 1. 2022)

26. The Julian calendar.

in Belgrade in 1938. A search performed within this resource indicates domestic digitized newspapers as a possible resource. *Digital NLS* is functional and user-friendly. No registration form on the site.

There are works that deal with the history of aviation which can be find in social science, culture and technology journals. The Serbian Library Consortium for Coordinated Acquisition (hereinafter KoBSON) (Kosanović 2003) is an excellent source of scientific papers in the field of aviation. KoBSON may provide high response but low precision. The keyword search, through the EBSCO Discovery Service was performed as follows. The following inquiries provided a great recall (1,277,719, 1,261,374, 111,588 and 1,181 hits) in the form of articles from journals, that is, serial and monographic publications:

- AVIATION HISTORY,
- AVIATION AND HISTORY,
- AVIATION HISTORY,
- AVIATION HISTORY with options: Full-Text (online), Peer Reviewed.

By applying the appropriate strategy, it is possible to obtain precise answer. Although the time interval 1900-2021 was set, narrowing of the search (to scientific journals and applying the subject term AVIATION HISTORY) , produced way less number of hits (117) but increased relevance.

Papers dealing with the history of domestic aviation can often be found in journals such as *Istorija 20. veka* (Journal of the Institute of Contemporary History)[27] and *Наслеђе* (Journal *Heritage*)[28] which are both on the DOAJ (*Directory of Open Access Journals*) list. For example: Bojan B. Dimitrijević[29] stands out among the authors of works from the history of domestic aviation in the *Istorija 20. veka*. In Наслеђе, with several articles in the

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27. Istorija 20. veka (Cobiss); The journal is publicly available online and has following metadata: Institut za savremenu istoriju, History (General) and History of Europe: History of Eastern Europe, 20th century, Balcan,contemporary history, Serbia, Yugoslavia, World War 2 (accessed 19.02.2022)

28. Nasleđe (Cobiss); The journal is publicly available online and has following metadata: Zavod za zaštitu spomenika kulture grad Beograda, Fine arts: Architecture, architecture, Belgrade, conservation, cultural monuments, heritage (accessed 19.02.2022).

29. Bojan B. Dimitrijević appears as an author and co-author of articles, reviews and other contributions in *Istorija 20. veka*; he is active in the editorial board of the journal Istorija 20. veka (приступљено 20. 2. 2022). He is author, co-author and reviewer of some monographs as well. More information Bojan Dimitrijević (Cobiss) (accessed 20. 2. 2022).

field of architecture, in which the topic of the buildings were aviation institutions, especially the aviation industry, the authors Biljana Mišić, Hajna Tucić and Saša Mihajlov must not be left out.[30] One of the latest works from the history of domestic aviation, which is on the DOI list, is the article by Ilija Kukobat "The beginnings of air transportation in post-war Yugoslavia 1945–1947", published in *Istorija 20. veka*.[31]

4 A possible model of a digital library on the history of aviation

According to previous experiences with websites presenting the history of aviation, as well as *Europeana* and *Digital NLS*, the digital library of the history of domestic aviation could be all-in-one, consisting of all the mentioned web resources. First of all, there should be a service for communication with users, i.e. site visitors, for the purpose of professional consultations as well as improving the quality of other services. Furthermore, following the example of the *Digital Collections of the WWII Museum*, the digital library could become the initiator of the oral history of domestic aviation. The search in the library may be performed on metadata as well as on all words in text type documents and the characteristics of *Avialogs* in terms of conciseness, *Europeana* in terms of encompassing various forms of cultural heritage artifacts, *Digital NBS* in terms of focus on the preservation of national heritage, *Digital Collections of the WWII Museum* in terms of oral history and organization of searches, metadata and the existence of a kind of terminological dictionary, *Air Team Images* in all aspects of aviation photography.

This library could also function as a virtual institute for the history of aviation in Serbia.

Regarding that the digital library could become a significant source for researchers in the field of domestic aviation history, a large number of description elements, that is, metadata would also be important.The following attributes would be welcomed: the owner of collection or single physical object, the name of collection, title, the title translated in English, id, author, spatial determinant (subject term), time determinant (subject term), scope, description, UDC classification, subject classification, annotation, medium,

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30. Biljana Mišić, Hajna Tucć, Saša Mihajlov – articles in the journal *Nasleđe*

31. Ilija Kukobat - the article from the journal *Istorija 20. veka* Vol. 38, no. 2/2020, pp. 173 – 186.

format, date of digitization, as well as aircraft type and version, airport (airfield), institution, event (manifestation), contributor (associate, predecessor, successor, family member).

The most important title in the digital library of the history of aviation in Serbia would be History of the Yugoslav Air Force (Микић 1933), the monograph that could be linked along with the memoirs of the same author (Микић 2000). Considering serial publications, it would be good to digitize *Vazduhoplovni glasnik* (Aviation Herald)[32] with its two appendices. The digital library would use links to other network locations of facilities related to the history of domestic aviation and cooperate with organizations that digitize history of domestic aviation artifacts, as well as with owners of private collections or family collections. Cooperation with the RS Ministry of Defense would be especially welcomed in terms of joint activities of the Military Archives and the *Aviation Museum* in Belgrade, in terms of digitization and promotion of archival and museum materials that are of great importance for the history of domestic aviation (Macura 2017). In case of digital libraries, teamwork and cooperation are taken for granted, thus establishing a kind of virtual community of admirers of the history of domestic aviation.

5   Conclusion

Digital, that is, network sources show the history of aviation in different ways. The content on the website is greatly influenced by different target groups of visitors: the professional public, the general public and those who are in the process of education. There are websites created by aviation professionals, enthusiasts and aviation enthusiasts themselves, as individuals, groups or societies. There are also academic resources, that is, websites of universities and cultural institutions that contain material from the history of aviation. Websites that present the history of aviation do so for educational or recreational purposes or to present their content as scientific information. The first electronic sources dealing with the history of aviation dates back to mid-1990s while organizations and associations have not stopped posting content from the history of aviation to this day. Each of the mentioned digital sources represents the history of aviation in its own way, but among them there is no source that according to its elements represents a digital library of aviation history. In that sense, *Avialogs* stands out from

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32. Vazduhoplovni glasnik (Cobiss)

the resources mentioned in the text. Although declared as an online library and community, *Avialogs* is closest to the idea of digital aviation history library. However, *Avialogs* does not offer a wide range of services but focuses on digitizing publications, accessing digital collections and possibly reproducing them for non-commercial purposes (printing or downloading). The new version of the site intend to provide a full-text search, a more detailed description by including more metadata, preferably based on some of the existing standard bibliographic descriptions, as well as an aviation history consulting service. Being enhanced this way, *Avialogs* would fulfill the purpose of a digital library. It would provide a range of different information services to those who access, whether they are the aviation professionals or just students, researchers, lecturers or general public.

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