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ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
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ANALYSIS OF METEOROLOGICAL CONDITIONS SIGNIFICANT FOR SMALL AVIATION AND TRAINING FLIGHTS AT THE AIRFIELD "BALKHASH" FOR PLANNING AND FLIGHT SAFETY PURPOSES

Abstract. Cloudiness and range of visibility are the most significant flight conditions for aircraft. The impact of clouds and visibility on the safety of aircraft flights, especially small aircraft, cannot be overestimated. According to the Interstate Air Committee, Kazakhstan ranks second in the number of aviation disasters. The average age of a third of Kazakhstan's small aircraft is more than 30 years. Over the past few years, 14 air accidents have occurred in the Republic of Kazakhstan, 11 of them with small aircraft.

In this work, we investigate long-term data on cloudiness and visibility at the most weather-favorable airfield in Balkhash, for the possibility of safe and economical flights of small aircraft and planning training flights.

Key words: analysis, planning, flight safety, weather conditions.

Induction. Cloudiness, its height and shape are one of the main characteristics of atmospheric processes and an essential factor in the radiation balance of the Earth – atmosphere system.

The average long-term cloudiness regime is formed under the influence of circulation processes that determine the prevailing direction of air masses and their moisture content, as well as under the influence of the underlying surface. Under the influence of local factors, the annual variation of all cloud characteristics is formed. The nature of cloudiness in the analysis area is rather peculiar. The reason for its appearance in the airfield area is the sharply continental conditions of the territory, the extremely low moisture content of the air masses participating in atmospheric circulation in the aerodrome area in summer and the proximity to the Asian maximum of atmospheric pressure in winter.

We investigated the number of cases with cloudiness less than 450 m. In winter, there is a general decrease in the lower limit of clouds.

Figure 1 shows the percentage ratio of cases with base of clouds (ceiling) less than 450 meters from January to December. The maximum of clear days falls on the summer months of July and August. Most often cloudy weather is observed in, from January to April and from September to December. From the analysis of the charts in figures 1 and 2, it can be concluded that low clouds have a well-defined annual course. The greatest recurrence of clouds below 450 m is observed in the cold season (January to April), the minimum in the warm (July, August).

Maximum cloudiness recurrence below 450 m is noted in winter during the night and morning hours. Minimum repeatability occurs in daytime for 15-17 hours. The evening and night repeatability minima of VNGO below 450 m are explained by the influence of breeze circulation, while the minimum in the middle of the day is associated with daytime warming and increased turbulent exchange.

Analysis of the various cloud forms recurrence reveals some characteristic features of the temporal distribution of different cloud forms.

The most repeatable are cirrus (Ci) and cumulus (Cu, As,) clouds, the maximum of which falls in the summer, when intense convection is most pronounced.

The least recurrence of cirrus clouds is observed in winter.

Cirrocumulus cloud (CC) has negligible repeatability (up to 2%) and it is not possible to identify any regularity of the intra-annual distribution.

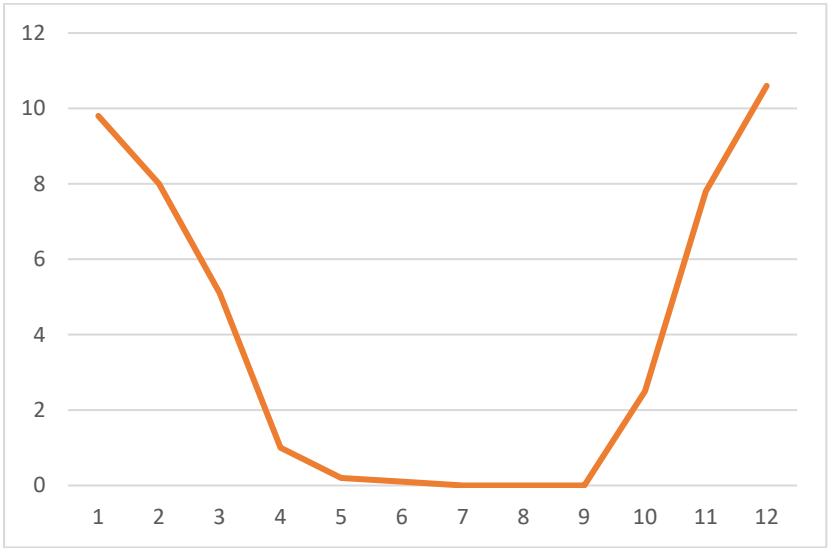

Figure 1 – Annual recurrence (%) of cloudiness less than 450 m, the amount of 5-8 octants at the Balkhash airfield

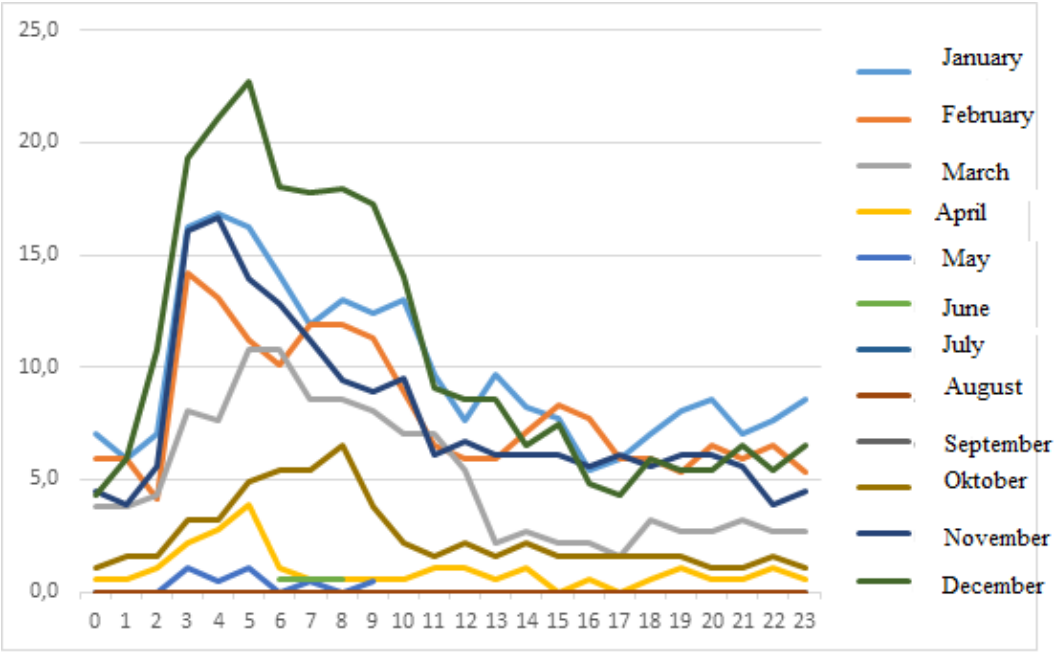

Figure 2 – Recurrence of cloudiness of 5-8 octants at Balkhash airfield in personal time of day by months

Cirrostratus cloudiness (Cs) has a well-defined annual variation with maximum repeatability in February and March (10-15%) and minimum in July and August (5-10%).

Very often observed high-cumulus clouds (Ac) are associated with both general circulation and convective processes. The maximum recurrence of high-cumulus clouds is in Summer period and in September-October. At this time, the recurrence of As on average reaches 25-30%. The least recurrence of high-cumulus clouds is observed in January, February when it decreases to 5-20%.

The annual variation of high-layered cloud (As) reflects the repetition of cyclones and associated fronts, which are usually preceded by this form of cloud. Most often, this form is observed in winter (10-25%) when cyclonic activity is more actively developed. In summer, the repeatability of highly layered clouds decreases to 5-15% in the north of the territory and to 1-10 in the south.

Cumulus (Cu) is almost not observed in winter. It usually develops in April, and has a well-defined summer maximum when its repeatability reaches 15-25%.

Cumulonimbus (Cb) has the same intra-annual distribution as cumulus, but its repeatability is less. Winter cumulus-rain is extremely rare, its repeatability mainly does not exceed 1%.

The recurrence of Stratus (St) is most often observed in winter (January, February).

Least often, Stratus clouds are observed in Spring, when their recurrence does not exceed 1%.

Stratus (Sc) is rare, this is due to the fact that its formation is associated both with the processes of destruction of the clouds of cumulus forms and with the advection of air masses. Maximum recurrence in autumn (6-10%).

Nimbostratus (Ns), has a well-defined annual variation. Its maximum recurrence is observed in winter.

Fracto-nimbus cloudiness are rare. Its highest recurrence is observed in Spring and Autumn (3-13%).

Along with the annual variation of the main cloud forms, their diurnal variation is well traced. Cirrus clouds have maximum recurrence, as a rule, during the daytime, and in the summer-time in the evening, during the spread of powerful cumulonimbus.

High cumulus has a pronounced diurnal variation. In winter, its maximum recurrence is less often observed at night and more often in the daytime, in spring-autumn periods, in the morning, in summer, high-cumulus clouds are observed at night. Altostratus with its intra-diurnal distribution repeats alto-cumulus, but the diurnal variation is smoother. Cumulus cloudiness has a maximum recurrence everywhere at 13:00, at the moment of the maximum development of convective cloudiness; in the rest of the observation periods, especially at night, its recurrence percentage is insignificant.

The maximum recurrence of cumulonimbus shifts to 19:00, although at 13:00 its recurrence is also significant, and the minimum, as a rule, falls in the morning. Stratus is more often observed in the morning and at night, less often during the day. The daily maximum of the recurrence of stratocumulus clouds is observed in Winter in the mornings, at a minimum temperature, in Summer, in the evening hours, when convective clouds spread.

Nimbostratus is observed more often in the morning and less often in the afternoon and evening. Fracto nimbus has insignificant recurrence. Most often it is observed together with nimbostratus, therefore, its daily variation resembles the nimbostratus variation, but less pronounced.

Visibility of less than 1000 m and less than 3000 m has an almost identical variation with highs in February, December and a slight shift in July. The minimum number of low visibility cases is observed in May and September.

Maximum visibility recurrence less than 3000m is observed in winter; between May and September, it is very small and does not exceed 1%.

From April to October, visibility less than 3000 m does not exceed 1% of cases.

Figure 4 shows the daily variation of gradations of visibility range less than 1000 m and less than 3000 m. From the analysis of graphs it follows that horizontal visibility has a well-defined daily course, which has several highs (1-3 hours of the night, 7 hours and from 14-19 hours).

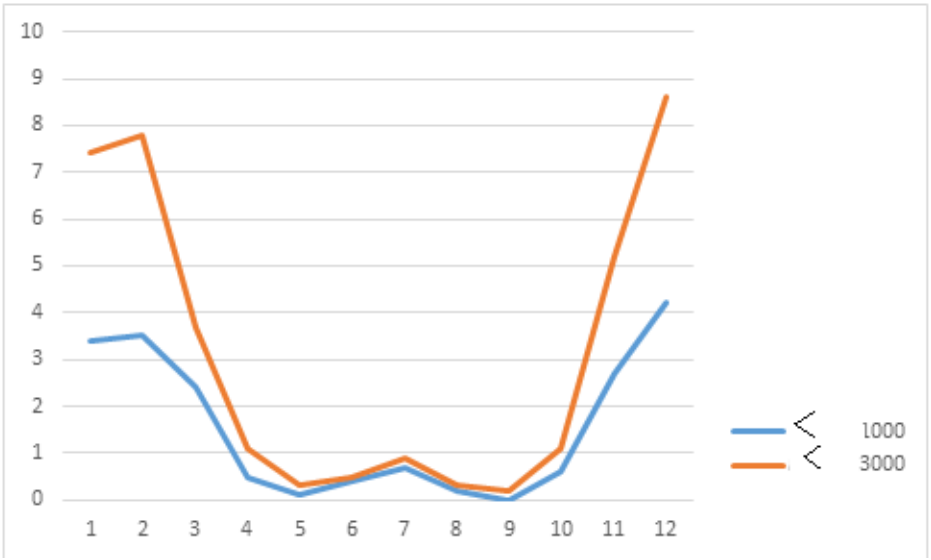

Figure 3 – Annual repeatability% low visibility at Balkhash airfield

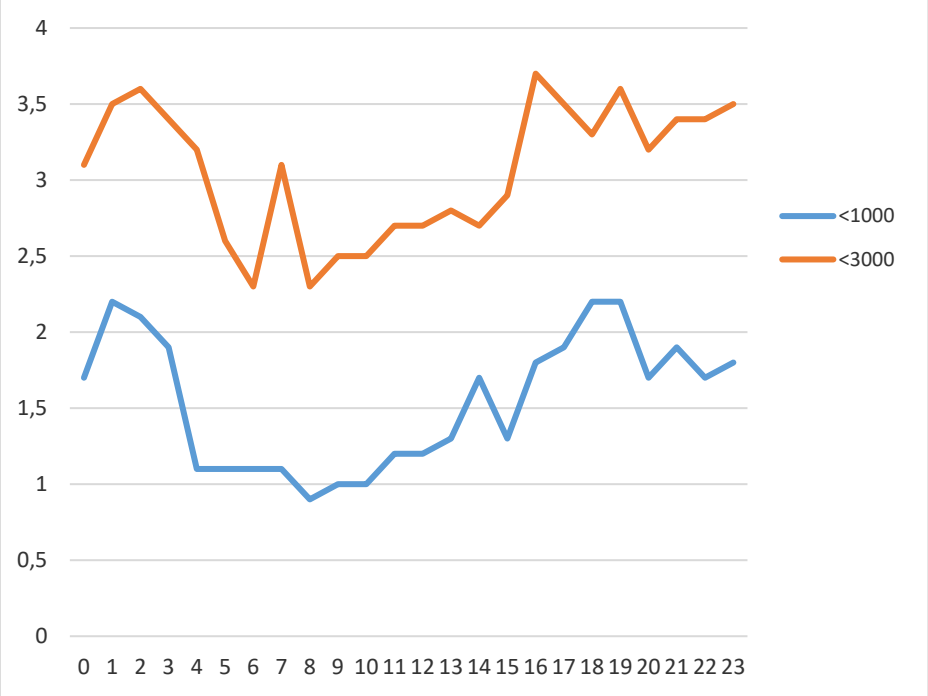

Figure 4 – Daily variation of % gradations of visibility range less than 1000 m and less than 3000 m

It is also interesting to consider the recurrence of observation of the range of visibility and/or the height of the lower edge of the clouds of the lowest layer with a significant and continuous cover of the sky cloud below the value of 3000/300 m in order to plan training flights. To do this, we built the following graphs presented in figure 5.

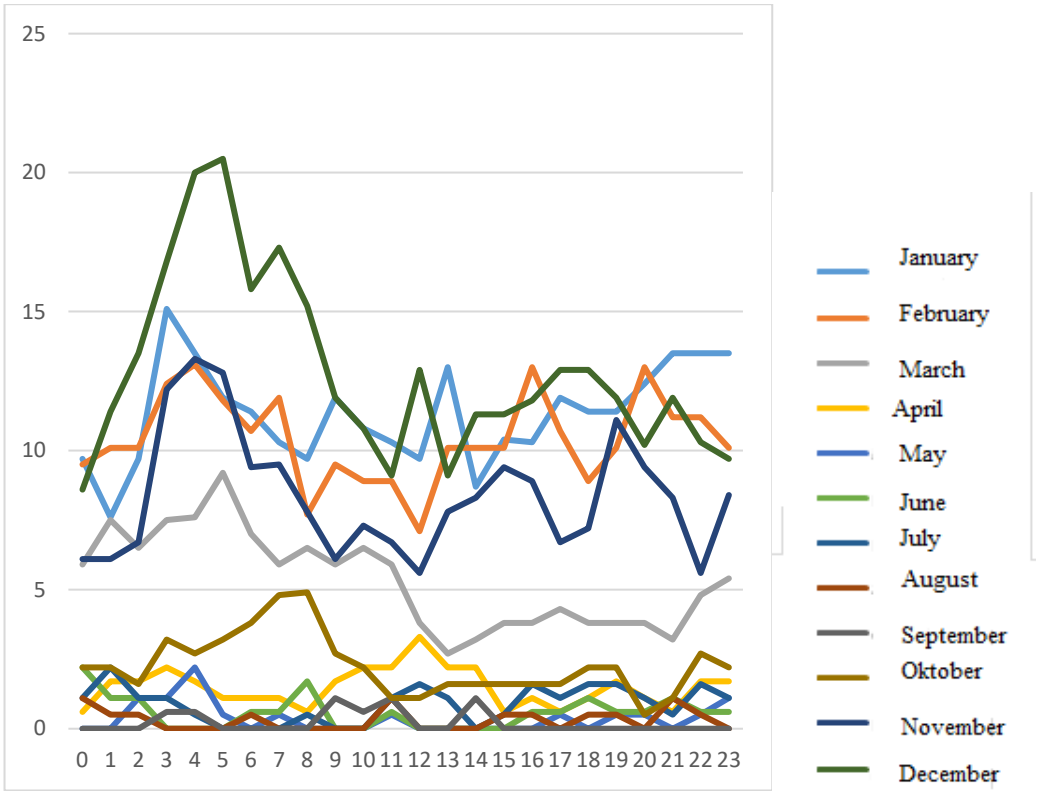

Figure 5 – Recurrence of cases of observation of visibility range and/or height of the lower boundary of clouds of the lowest layer with significant and continuous cover of the sky of cloud below the value of 3000/300 m

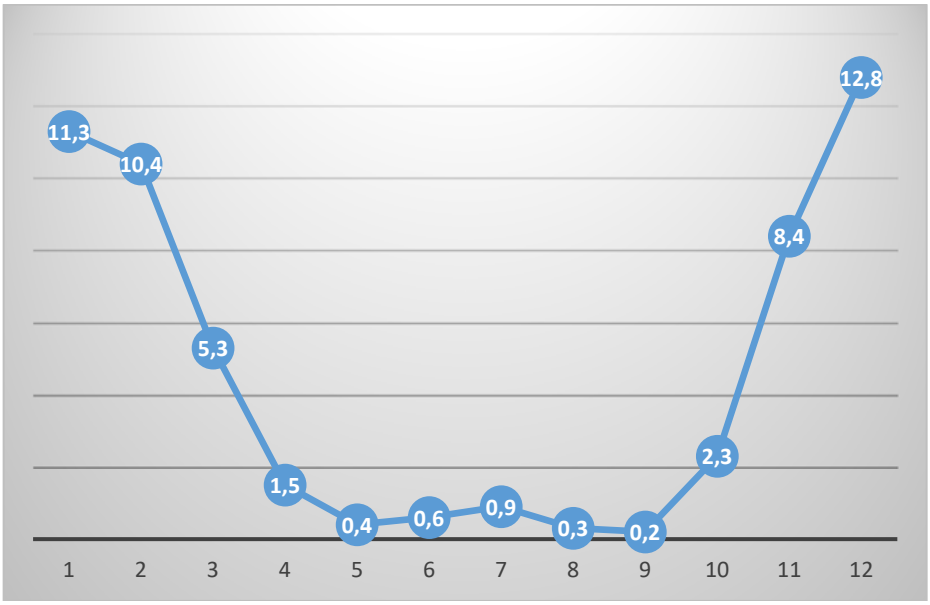

Figure 6 – Average repeatability, %, of visibility range and/or lower cloud height observations of the lowest cloud layer BKN or OVC below 3000/300 m

An analysis of the schedules suggests that the most favorable period for flights is from April to September. The most difficult flight conditions are noted in January and December. During the day, the most favorable hours for flights in the daytime from 4.00 to 13.00.

Н. Долженко, Е. Майлянова, И. Асильбекова, З. Конакбай

Азаматтық авиация академиясы, Алматы облысы, Қазақстан

ҰШУДЫ ЖОСПАРЛАУ ЖӘНЕ ҚАУІПСІЗДІК МАҚСАТТАРЫ ҮШІН «БАЛХАШ» ӘУЕАЙЛАҒЫНДАҒЫ ШАҒЫН АВИАЦИЯ ЖӘНЕ ОҚУ-ЖАТТЫҒУ ҰШУЛАРЫ ҮШІН МАҢЫЗДЫ МЕТЕОРОЛОГИЯЛЫҚ ЖАҒДАЙЛАРДЫ ТАЛДАУ

Аннотация. Бұлттылық пен көріну – бұл әуе кемелерінің ұшуының маңызды шарттары. Бұлттылық пен көрінудің әуе кемелерінің, әсіресе шағын ұшақтардың қауіпсіздігіне әсерін асыра бағалау қиын. Мемлекетаралық авиация комитетінің бағалауы бойынша, Қазақстан авиациялық апаттар саны бойынша екінші орында. Kazakhstan шағын ұшақтарының үштен бірінің орташа жасы 30 жастан асады. Соңғы бірнеше жылда Қазақстан Республикасында 14 авиациялық апат болды, оның 11-і шағын авиациямен. Бұл жұмыста біз ауа-райы жағынан ең қолайлы аэродромдағы бұлттылық пен көріну туралы ұзақ мерзімді деректерді зерттейміз. Балқаш қаласы, шағын ұшақтардың қауіпсіз, үнемді ұшуы және оқу рейстерін жоспарлау мүмкіндігі үшін.

Бұлттылық, оның биіктігі мен формасы атмосфералық процестердің негізгі сипаттамаларының бірі және Жер - атмосфера жүйесінің радиациялық балансының маңызды факторы болып табылады.

Түйін сөздер: талдау, жоспарлау, ұшу қауіпсіздігі, ауа райы жағдайлары.

Н. Долженко, Е. Майлянова, И. Асильбекова, З. Конакбай

Академия гражданской авиации, Алматинская область, Казахстан

АНАЛИЗ ЗНАЧИМЫХ ДЛЯ МАЛОЙ АВИАЦИИ И УЧЕБНЫХ ПОЛЕТОВ МЕТЕОРОЛОГИЧЕСКИХ УСЛОВИЙ НА АЭРОДРОМЕ «БАЛХАШ» ДЛЯ ЦЕЛЕЙ ПЛАНИРОВАНИЯ И БЕЗОПАСНОСТИ ПОЛЕТОВ

Аннотация. Облачность и дальность видимости являются наиболее значимыми условиями полета воздушных судов. Влияние облачности и видимости на безопасность полетов воздушных судов, особенно малой авиации, трудно переоценить. По данным Межгосударственного авиакомитета, по числу авиационных катастроф Казахстан занимает второе место. Средний возраст трети воздушных судов малой авиации

Казахстана составляет более 30 лет. За последние несколько лет в Республике Казахстан произошло 14 авиационных происшествий, 11 из которых – с воздушными судами малой авиации.

В статье приведены результаты многолетних данных об облачности и видимости на наиболее благополучном с точки зрения погоды аэродроме г. Балхаш для возможности безопасных и экономичных полетов малой авиации и планирования учебных полетов.

Облачность, ее высота и форма являются одной из основных характеристик атмосферных процессов и существенным фактором радиационного баланса системы Земля – атмосфера.

Ключевые слова: анализ, планирование, безопасность полетов, погодные условия.

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