The RASC Montreal Centre
Double Star Certificate Program
By Carl Jorgensen

The RASC Montreal Centre Double Star Certificate Program was the brain child of RASC Montreal Centre member Carl Jorgensen and was officially adopted at the RASC Montreal Centre's Annual General Meeting on Nov. 18 2016.

History: Mizar, the middle star in the handle of the Big Dipper, is the easiest double star for the novice to locate. It boasts historical importance as the first double star discovered. Until a few decades ago, credit for the discovery went to the Jesuit astronomer Jean Baptiste R reported the star's duplicity around 1650. But a recent investigation of Galileo's nc that a former student of his, Benedetto Castelli, observed Mizar in 1617.

Christian Mayer
An Artist Concept

The first catalogue of double stars was compiled by Christian Mayer in 1779 and c entries. It was the work of Herschel and especially Struve who gave the whole subj which was lacking. Struve's Mensurae Micrometricae (which gave the catalogue its name) appeared in 1837, was a huge work.

Why Observe Double Stars: Double-star observing offers many attractions for amateur astronomers — light pollution, whether from man or Moon, has little impact on the image, and even a modest 3-inch telescope will show all the best doubles in the sky. In my opinion, a pretty double in a small scope is lovelier than a faint smudge of a galaxy in a giant light bucket.

The Double Star Program: There are thousands of double stars visible in telescopes of varying sizes. To observe thousands of doubles would be a daunting task, and an observer facing such a task probably would not take on such a program. To make the program more appealing, I chose 300 of the more interesting double stars out of the thousands visible in our telescopes. With an eight inch reflector telescope you can observe all the 300 double and multiple stars in the Program. However, there are three certificates you can earn if you decide to embark on the program. The 3 certificates in the Montreal Centre Double Star Program are Bronze, Silver and Gold.

Bronze Certificate: For a member to qualify for the RASC Montreal Centre Double Star Program Bronze Certificate, the member must observe and separate 100 of the program's 300 target stars by star hopping (not using a GoTo telescope). The member will be able to find 100 of the 300 stars using a 2 inch refractor or a 3 inch reflector.

Silver Certificate: For a member to qualify for the RASC Montreal Centre Double Star Program Silver Certificate, the member must observe and separate 200 of the program's 300 target stars by star hopping (not using a GoTo telescope). The member will be able to find 200 of the 300 stars using a 4 inch refractor or 5 inch reflector.

Gold Certificate: For a member to qualify for the RASC Montreal Center Double Star Program Gold Certificate, the member must observe and separate all of the program's 300 target stars by star hopping (not using a GoTo telescope). The member will be able to find all of the 300 stars using a 6 inch refractor or 8 inch reflector. See below for the miniaturized version of the RASC Montreal Center Double Star Program Certificates.

Bronze Certificate

Silver Certificate

Gold Certificate

The form that contains the 300 double stars is named Double Star Record. Below is a sample showing the first 2 entries in the record. The member can Change the title by putting his name there, for example **Carl's Double Star Record**. .

* h3945 in Canis Major is described by many as the Winter Albireo			
RASC Montreal Center Target Star #1		RASC Montreal Center Target Star #2	
Double Star	γ Andromedae	Double Star	Σ 79
Constellation	Andromeda	Constellation	Andromeda
Magnitude A	2.3	Magnitude A	6
Magnitude B	5.1	Magnitude B	6.9
Separation A - B	10"	Separation A - B	8"
Position Angle A - B	64°	Position Angle A - B	194°
Color A - B	gold - blue	Color A - B	
RA/Dec	02h 03m / +42° 20'	RA/Dec	01h 00m / +44° 43'
Date (dd/mm/yyyy)	28/08/2015	Date (dd/mm/yyyy)	01/08/2019
Time (hh:mm) / TZ	00:45 / EDT	Time (hh:mm) / TZ	00:10 / EDT
Observing Location: 1503 Bellevue Greenfield Park QC (backyard)		Observing Location: Latitude 44.265678 N Longtitude 73.480755 W Adirondack Astronomy Retreat Twin Valleys Lewis N.Y	
Seeing / Transparency	3 / 3	Seeing / Transparency	3 / 5
Instrument: 90 MM X 1000 MM refractor (Neptune)		Instrument: 200 MM X 1200 MM Dobsonian reflector (Pegasus)	
Power	66X	Power	80X
Remarks : A beauty, gold - blue. No Star hopping necessary, since the star can be seen naked eye so it was easily found in the finder.		Remarks : Nice double star near M31. Started star hopping from γ Andromedae.	

Following is an explanation of the terms used in The Double Star Record on the previous page. Within the table are 20 rows.

Row 1: is self-explanatory. It numbers the double or multiple star entries from 1 to 300.

Row 2: is the name of the Double or Multiple Star. Below are alternate names for both γ Andromeda & Σ 79

Alternate names for γ Andromeda

Henry Draper Catalogue (HD)	12533
Hipparcos Catalogue (HIP)	9640
Bayer	γ (Gamma) Andromedae
Flamsteed	57 Andromedae
Struve (Σ)	205
Name	Almach

Alternate names for Σ 79

Henry Draper Catalogue (HD)	5789
Hipparcos Catalogue (HIP)	4675
HR	283
SAO	36833
Struve (Σ)	79

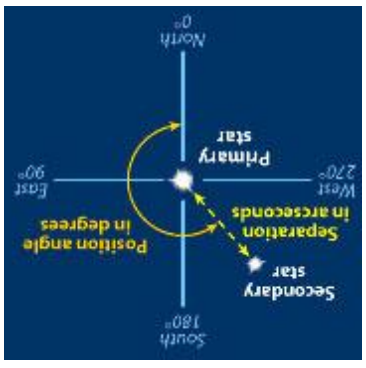
Row 3: Self-explanatory. The constellation where the double or multiple resides. There are target stars from every constellation viewed from the Northern Hemisphere from Andromeda to Vulpecula.

Row 4: Magnitude of the primary star of the target star. A is the letter designated to the primary star and B for the companion. The primary is the brightest star in target system.

Row: 5 Magnitude of the companion designated with the letter B. In case of multiple stars, the companions are designated B C D etc. D being the faintest companion of the target system. No primary or companions of the 300 target stars are fainter than 12th magnitude making every target star visible in an 8" reflector telescope.

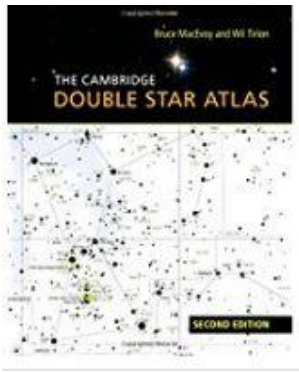
Row 6: Shows the separation between the components of the double or multiple stars in arc seconds. The smaller the separation the harder it is to separate the targets. There are no target stars with less than 1 arc second making every target star able to be separated with an 8" reflector telescope.

Row 7: Shows the position angle in degrees from the primary A to the companion B. Intersecting lines are made from North to North and East to West in your field of view in your telescope The primary is placed on the intersection of the North to South and east to west lines line. The position angle is measured from North to South line in a counter clockwise direction to the companion. See the diagram to the bottom right defining position angle & separation. Notice the north is at the bottom & south at the top because usually Telescopes refracting or reflecting invert the image. If you have a non inverting telescope the North will be at the top and the south at the bottom. In this case you measure the position angle clockwise.



Row 8: Self-explanatory. The colors of the different components of the Target stars. Not all target has the colors listed, because when observing some of the target Stars it is hard to distinguish the colors.

Row 9: Shows the right ascension (RA) and declination (Dec) so you can find the target star on star charts, either printed or online versions. An example of a printed star atlas is The Cambridge Double Star Atlas (near right) and an example of an online line atlas is (Stellarium), a free download (far right).



Rows 1 through 9 describe facts about the target. These facts come from many surces, two of which are shown at the right. Other printed sources of information include Double Stars for Small Telescopes by Sissy Haas and the RASC Observer's Hanbook fron which I included 75 targets in the Double Star Record, because the star colours were listed for each.

Rows 10 to 20 allow the member to provide information of his or her observation of the target stars.

Row 10: The date of the observation.
Row 11: The time the member confirmed separation.

Row 12 & 13: The location where the observation was made.

Row 14 allows the recording of the seeing & transparancy as judged by the member while making his observation. The RASC National Office has adopted the following standard scale for seeing & transparancy.

For Seeing: 1 = Best 2 = Above Average 3 = Average 4 = Below Average 5 = Poor
Note: A somewhat hazy sky may provide good seeing; therefore, use this for measuring stability only.

For Transparency: 1 = Best 2 = Above Average 3 = Average 4 = Below Average 5 = Poor
Note: A crystal clear sky may provide less than perfect seeing; therefore, use this for measuring clarity only.

Row 15 and 16: The instrument the member used for his or her observation. Example 200 mm X 1200 mm Dobsonian Reflector, where 200 mm represents the diameter of the mirror and 1200 mm represents the focal length of the mirror.

Row 17: The power used to make the observation. To calculate the power, use the following formula: $Power = \frac{Focal\ Length\ of\ mirror}{Focal\ Length\ of\ eyepiece}$ For example: If the focal length of the mirror is1200 mm and the focal length of the eyepiece is 10 mm then: $Power = \frac{1200}{10}$ = 120X.

Row 18, 19 and 20: These 3 rows are reserved for the member's remarks about his or her observation.

Since the Double Star program was first initiated on Nov 18 2016 two additional certificates were added to the program. The Sirius Certificate, below left, and the Beginners Certificate, below right.

The Sirius Certificate was added to the program, because a user mentioned to me that he observed and separated Sirius A, and Sirius B , a very famous double star that was not one of the double stars in the program. The user was disappointed because he received no credit for his separation of Sirius. Yes, Sirius is a famous double star, but it is not easy to separate. Although Sirius, with a separation of 11" should be easy, because Sirius A is so bright compared to its 9th magnitude blue companion Sirius B, it is hard to see. If I added Sirius to the double star program, very few double star observers would be able to receive the gold certificate by observing all 300 of the double stars. To recognize users who do observe and separate Sirius, I added the special RASC Montreal Centre Double Star Program Sirius Certificate in March of 2017.

The Beginners Certificate: To receive the Bronze Certificate the requirements are that an observer must observe and separate 100 of the program's 300 target stars. An observer starting out may find that even 100 stars is a daunting task. To encourage beginners in astronomy to take on the program, I thought it would be nice to add the RASC Montreal Centre Double Star Program Beginners Certificate (added on Jan 20 2019). The requirement to receive the Beginners Certificate is that the double star observer must observe and separate 25 of the program's 300 target stars. This certificate may be more appealing to a beginner starting the double star program. Every Certificate earned is progressive to the next certificate. After the Beginners Certificate you can include the 25 targets already separated to contribute towards the Bronze Certificate if you choose to continue.

Forms needed for the program: 1 Double Star Instructions, 2 the Double Star Record for recording your observations and 3 the Double Star Listing to keep a chronological list of your observations. One can find the forms in the Members Section of the RASC Montreal.org website (at http://www.rascmontreal.org/). I can also email you the forms at your request to email address secretary@rascmontreal.org.

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French Versions: On March 9 2021 French versions of the Certificates were added to the RASC Montreal Centre's Double Star Certificate Program. The French versions of the certificates are shown below.

Beginner's Certificate

Bronze certificate

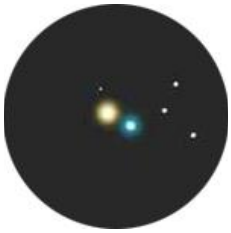
Silver Certificate

Gold Certificate

Sirius Certificate

Below are 15 images of interesting target stars to help a member get started on the program.

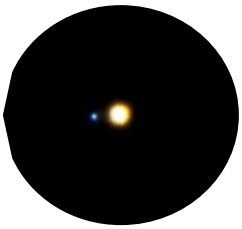
1 Albireo (β Cygni) (summer)



2 Mizar (ζ Ursae Majoris) (all year)

3 Miram (η Persei) (fall)

4 Almach (γ Andromedae) (fall)



5 h3945 (145 Canis Majoris) (winter)

6 Achird (η Cassiopeiae) (all year)

7 Graffias (β Scorpii) (summer)

8 Jabbah (ν Scorpii) (summer)

9 The double – double (ε Lyrae) (summer)

10 ζ Lyrae (7 Lyrae) (summer)

11 Al Sufi (σ Orionis) (winter)

12 Mintaka (δ Orionis) (winter)

13 Trapezium (θ1 Orionis) (winter)

14 Σ2816 & Σ2819 in Cepheus (all year)

15 Alrediph (δ Cephei) (all year)

All the target stars shown on this page can be found & separated with a 2” refractor or a 3” reflector or greater.