

# Windows International Mars Patrol Astronomical Calculator - WIMPVSOP

Jeff Beish A.L.P.O. (Rev. 18 April 2024)

## INTRODUCTION

In the early 1980's the A.L.P.O. Senior Mars Recorder, Charles F. ("Chick") Capen, suggested to the Mars Section that we should generate computer programs to assist in the Section's observing programs and our ongoing meteorological survey of Mars. He also urged us to find a way to replace the physical Ephemeris for Mars published in the expensive Astronomical Almanac. He knew that my engineering background included computer programming and heavy-duty aerodynamics, so he thought my training might possibly help in this endeavor. Little did he know that the required mathematics necessary in computing an ephemeris is not usually taught in engineering colleges and it was nowhere to be found in my past experience. We first worked on computer programs for the meteorology survey of Mars and then for our polar cap measurement projects.

Capen further suggested that I consult with John Westfall, Professor of Geography, and with Walter Haas, A.L.P.O., founder and Professor of Mathematics, since they had been active in several high level analytical projects for A.L.P.O. and had the expertise necessary to steer me down the right path to accomplish this task. With the aid of several books on the subject and encouragement from John and Walter, this author set out to learn a new form of majestic mathematics; spherical trigonometry. Then I began to write programs for the physical Ephemeris of Mars. Eventually the International Mars Patrol Astronomical Calculator ("IMPAC") was born.

I first used a FORTRAN IV compiler at my workplace to write some very basic routines and also a very rudimentary form of BASIC used by our Digital Equipment Corporation (DEC) computers. To begin working on this project at home a copy of Microsoft Quick Basic was used to create programs just for the ephemeris of Mars. As time passed, other Solar System objects were added to the package, e.g., the Sun and Moon, Mercury, Venus, Jupiter, Saturn, Uranus and Neptune. Eventually these programs were rewritten, re-coded and compiled using Microsoft Visual Basic Pro 5.0 and "IMPAC" evolved into "WIMP" -- the Windows version of IMPAC.

## WIMP MATH and METHODOLOGY

Many of the mathematical routines used in WIMP can be found in books by Jean Meeus, W.M. Smart and Peter Duffet-Smith (see **Appendix I -- FURTHER READING**). John Westfall gave me a copy of his program for computing physical ephemeris of Mars and Walter Haas rendered advice on how to interpret the mathematics -- both were of great help.

Eventually the WIMP programs were re-written and computer coded in the rigorous VSOP87D methods. I found the VSOP equations in a program called "NeoEphemerix 2001," on the web site, "Planet Source Code," and "VSOP87 Functions used to Compute Planetary Positions," web site "FreeVBcode.com," both written by Jay Tanner. These extensive programs contain thousands of lines of computer code and would have taken years to type into my PC; however, Jay included the entire program listings in his articles, so it was easy to gleam (cut and paste) all this necessary code to augment my computer coding for the WimpVSOP series.

The WimpVSOP subdirectory is 16-Megabytes, whereas the older Wimp version is only 2.75-Megabytes. This is not a problem for modern PCs due generous amounts of hard drive space and computer speed; much, much more so than the PCs of the 1980's when Wimp was first created. Also, up to date modern software, such as that used in Microsoft Windows, is versatile

and much easier to understand than past versions of “machine code” and assembly computer languages we used in mainframe computer systems.

WIMP was first created to do the daily ephemeris listings for Mars and subsequently the other planets were added. Eventually real-time programs were written to allow the programs to update using the PC clocks and display the positional and physical ephemeris of Solar System objects. The WIMP ephemeris program series uses the methods of “Elements of the Planetary Orbits” and computer coded to represent the “Elements for the Mean Equinox of the Date.” For those interested in Visual Basic code for Computing the Physical Ephemeris of Mars, click [Mephemeris](#).

### **PROGRAM SETUP AND REVISIONS**

NOTICE: Wimp programs are located at [Groups.IO/wimpvsop](#) in the “Files” folder and the ephemeris listings in “Ephemeris Listings” folder. Security is scanned at VIRUSTOTAL (<https://www.virustotal.com/gui/home/upload>), so the files will be safe from hackers. The ephemeris listings for the Moon, Sun and planets for the years 2019 – 2030 are contained in each zipped file. **Also, due to the constant changes in Windows , I have moved the WIMP programs from C:\Program Files (x86)\WIMPV SOP back to C:\Wimp.**

One major problem in program development in Windows is keeping up with their constantly updating and revising Windows for tighter security that renders many older programs, like WIMP, from properly functioning. One must consistently generate workarounds to keep ahead of Microsoft and fake out their security measures in order to run older software.

Until recently the old “VB5 Application Setup Wizard” would not work; however, Microsoft updates now allows this program to work and it can be used to generate a setup for new users that automatically loads the appropriate dependency files to the **Windows/System32** folder and installs the Wimp programs in the “C:\Wimp.” The full setup (*WimpSetup.zip*) is now available.

The following is a manual setup. The issue with loading files into systems folders is the User Account Control (UAC) controls and other security measures. Ultimately, one must run WIMP in the “Run as Administrator” mode so the program Application Programmer's Interface (API) functions correctly (See **Appendix 1I -- API functions for detailed discussion**).

**To setup WIMP for first time users continue to the following steps.**

**STEP 1.** Go to [Groups.IO/wimpvsop](#) then select **WimpSetup.zip**, then *Download* and save to a *temp folder*.

**STEP 2.** Unzip all files from **WimpSetup.zip** to the *temp folder*

**STEP 3.** Double click *Setup.exe* and follow prompts; Click **Ok** in “WimpSetup.zip” window, **the make sure in next window under “Directory” then change it to “C:\Wimp\”**



**Step 4.** Click the icon above and follow prompts until last window stating “successfully completed.”

**Step 5.** Create a desktop icon using the `C:\Wimp\WimpVSOP.exe` (See: [Shortcut](#))

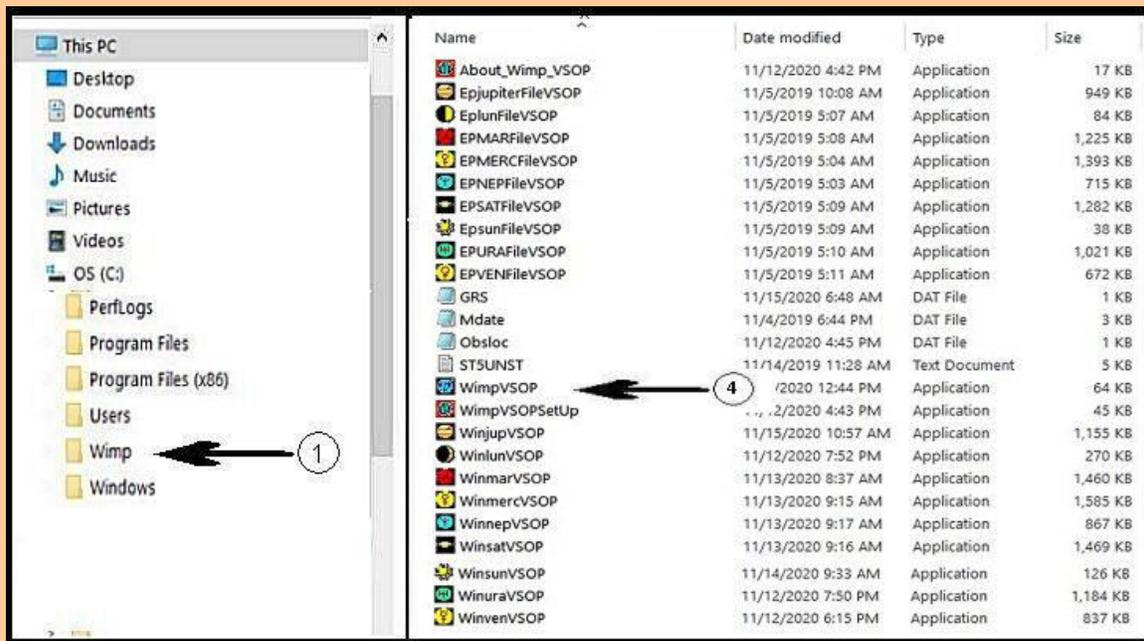
**NOTE:** If an error stating “msvbvm50.dll not found” window pops up Go to [Groups.IO/wimpvsop](#) and select `msvbvm50.exe`, then *Download* and save to a *temp folder* and *double click* `msvbvm50.exe` to load DLL files to Windows.

To setup WIMP for current users continue to the following steps.

**STEP 1.** Use *File Explorer* to create a new folder, " `C:\Wimp\`".

**STEP 2.** Go to [Groups.IO/wimpvsop](#) using a *browser* or from WimpVSOP Menu select “**Update**” and “**Yes**” then from the **Groups.IO** menu select **UpWimpVSOP.zip**, then **Download** and save to `C:\Downloads`.

**STEP 3.** Unzip all files from **UpWimpVSOP.zip** to the `C:\Wimp\` (see the box below).



**New WimpVSOP Program Folder**

**STEP 3.** Create a desktop icon using the `C:\Wimp\WimpVSOP.exe` (See: [Shortcut](#))

You can erase the setup files in the *temp folder* and save **WimpSetup.zip** or **UpWimpVSOP.zip** in a safe location.

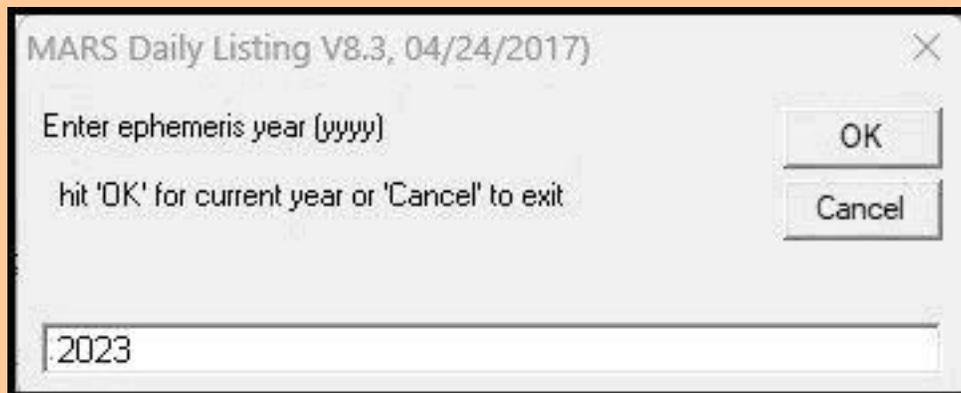


Running WIMP: On Desktop double click

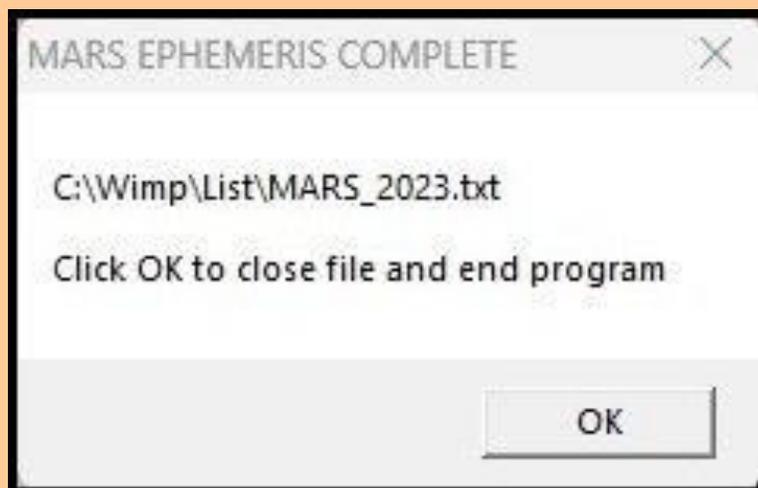
The first time the Wimp Menu runs it checks for a sub folder, "C:\Wimp>List" and if missing creates it. Therefore the Wimp programs will now reside in the Documents folder and the daily listing files will be stored in the C:\Wimp>List sub folder.

### WIMP DAILY LISTINGS PROGRAM

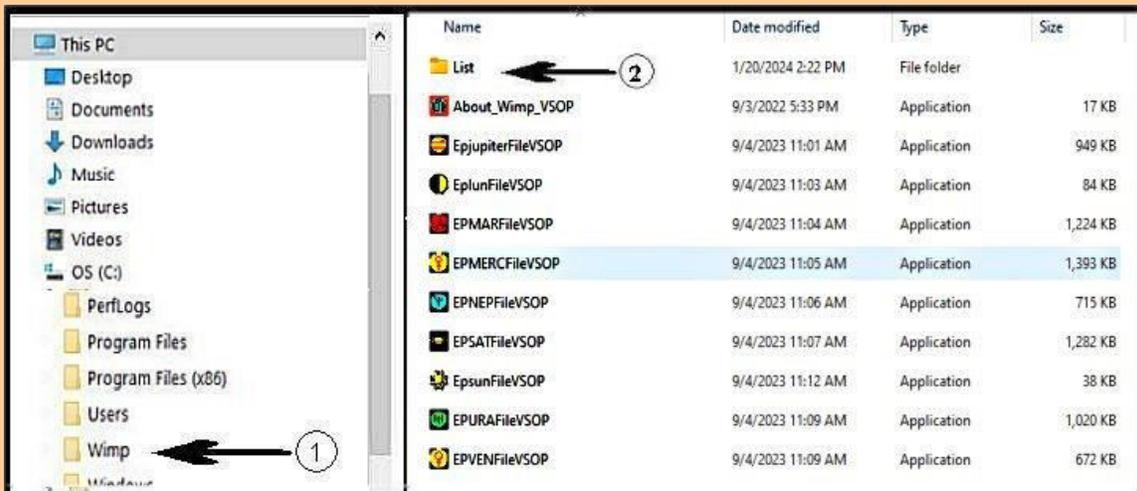
Programs were created to make ASCII text files of a daily ephemeris listing for each object and then store them on hard drive to be later used to make a hardcopy or HTML file. When a particular Solar System object is selected in the menu window a panel will appear asking for the desired year and the ephemeris will be computed. When this program ends an ASCII file will appear in "This PC\C:\Wimp>List" as *planet\_year.txt* and a panel will appear displaying the location of said file.



The Wimp/List window for Daily Listings



The Wimp/List window for Daily Listings Complete



Hard Drive Location of Daily Listings in C:\Wimp>List\

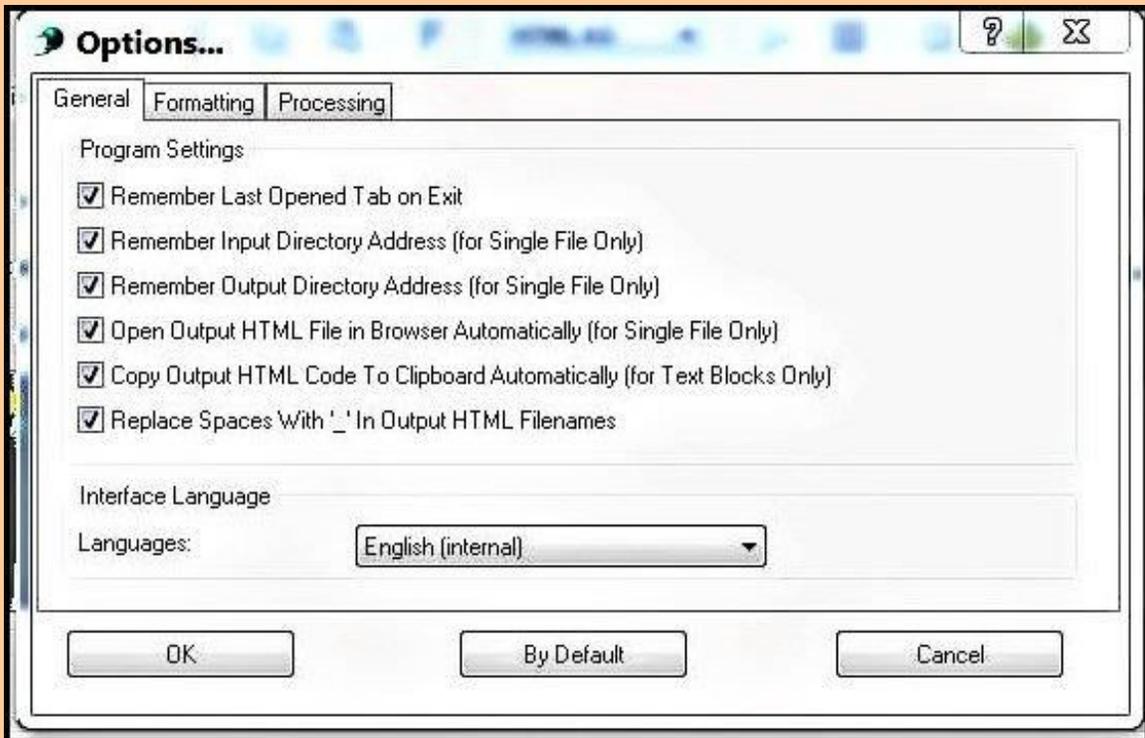
A finished text file can be converted later from ASCII into HTML formatted files by using a free computer program, “*Easy Text-To-HTML Converter*” that can be obtained at [Softonic.com](https://easy-text-to-html-converter.en.softonic.com/download) <https://easy-text-to-html-converter.en.softonic.com/download>. For the best results use Microsoft’s Notepad, and set to *Courier New, Size 10 or 11* to save the file.

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF MARS (0 hr U.T.) - 2023 (Compiled by: Jeffrey D. Beish, A.L.P.O.)														
Date	Elong	R.A.	Dec	Dist	Ls	De	Ds	---Phase---	Defect	Axis	Size	Mag	CM	
yyyy-mm-dd	o	hh:mm	o	A.U.	o	o	o	k i	o	o	,,	(v)	o	
2023-Jan-01	148.7E	04:27	24.6	0.638	2.8	-8.8	1.2	0.973	19.1	85.7	324.8	14.7	-1.2	314.3
2023-Jan-02	147.5E	04:26	24.6	0.644	3.3	-8.9	1.4	0.971	19.7	85.4	324.8	14.5	-1.2	305.4
2023-Jan-03	146.3E	04:26	24.6	0.650	3.8	-9.0	1.6	0.969	20.4	85.1	324.7	14.4	-1.2	296.4
2023-Jan-04	145.2E	04:25	24.5	0.657	4.3	-9.0	1.8	0.967	21.0	84.9	324.7	14.3	-1.1	287.4
2023-Jan-05	144.1E	04:25	24.5	0.663	4.7	-9.1	2.0	0.965	21.6	84.7	324.7	14.1	-1.1	278.3
2023-Jan-06	143.0E	04:24	24.5	0.669	5.2	-9.1	2.2	0.963	22.2	84.5	324.6	14.0	-1.1	269.3
2023-Jan-07	141.9E	04:24	24.5	0.676	5.7	-9.2	2.4	0.961	22.7	84.3	324.6	13.8	-1.0	260.3
2023-Jan-08	140.8E	04:24	24.5	0.683	6.2	-9.2	2.6	0.959	23.3	84.2	324.6	13.7	-1.0	251.2
2023-Jan-09	139.7E	04:23	24.5	0.690	6.7	-9.2	2.8	0.957	23.8	84.0	324.6	13.6	-1.0	242.1
2023-Jan-10	138.6E	04:23	24.5	0.697	7.2	-9.2	3.1	0.955	24.4	83.9	324.6	13.4	-0.9	233.0
2023-Jan-11	137.6E	04:23	24.5	0.704	7.7	-9.2	3.3	0.954	24.9	83.7	324.5	13.3	-0.9	223.9
2023-Jan-12	136.6E	04:23	24.5	0.711	8.2	-9.3	3.5	0.952	25.4	83.6	324.5	13.2	-0.9	214.8
2023-Jan-13	135.5E	04:23	24.5	0.718	8.7	-9.3	3.7	0.950	25.9	83.5	324.5	13.0	-0.8	205.7

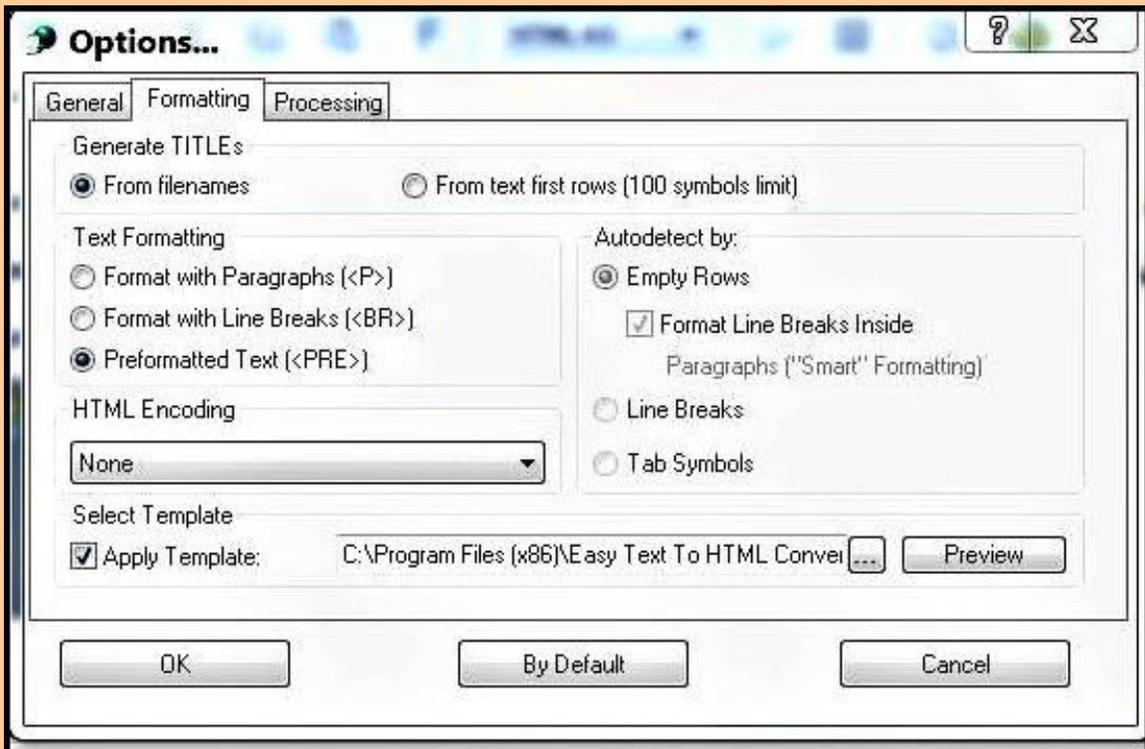
Typical Wimp/List Daily Listing file for Mars using Microsoft’s Notepad set to *Courier New, Size 10*

Using Easy Text To HTML Converter: First open the File menu and select Options and in the General tab setup *Program Settings* and then in the Formatting tab set the *Generate TITLE* as in the next figures:

:



Options Program Settings



Options Generate TITLE

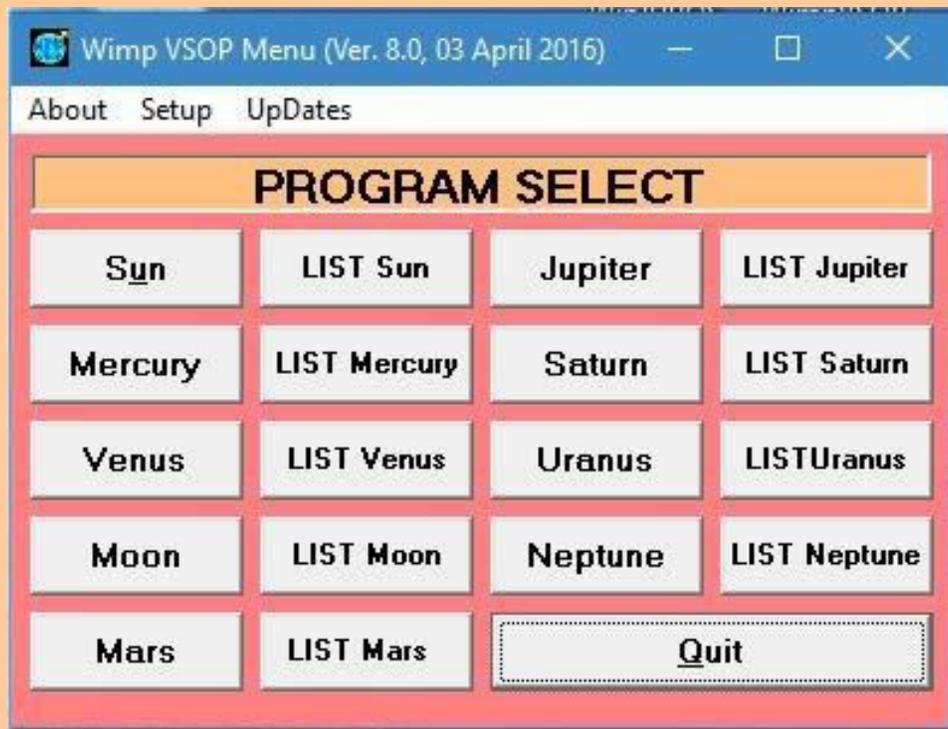
## WIMP IN REAL-TIME

After WIMPVSOP has been installed an ICON should appear on the Desktop to run the program MENU. If this does not occur then manually create a desktop icon by right clicking the screen to "New", then make a "Shortcut," then follow the instructions "C:\Wimp\WimpVSOP.exe".



WIMPVSOP Desktop Icons

A WIMP menu panel will appear displaying each of the nine (9) "Solar System Objects" with their respective names labeled on the selection button. The left button selects the Real Time Wimp program and the right button for the daily ephemeris listing for each object



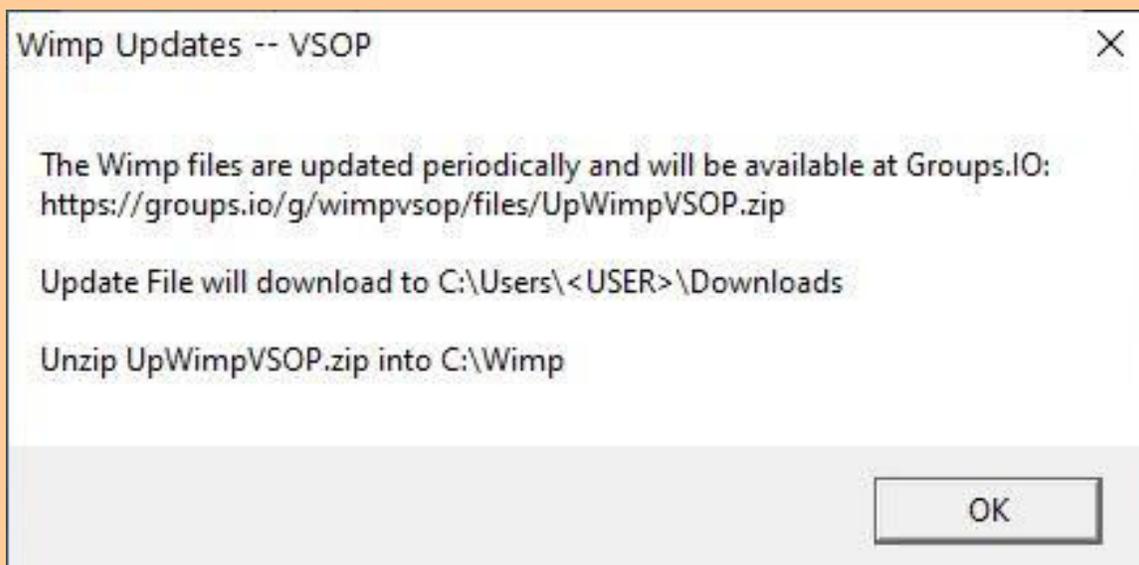
The Wimp Menu Panel.

The menu panel features an "About" item to define the general elements of the Wimp programs. A "Setup" menu item is available to set the observer's physical location (city and state), the latitude and longitude of the observatory, time zone, if Daylight Savings is used and what Internet Browser you use. Only Chrome, FireFox and Internet explorer are listed. After setup is complete then each Wimp program will use the stored information to solve the observer's terrestrial location when needed. (NOTE: Hit "DONE" when finished to store values away).



The Wimp Setup Panel.

Also, the "UpDates" menu starts your Internet browser and takes you to [Groups.IO/wimpvsop](https://groups.io/g/wimpvsop) where you then select **UpWimpVSOP.zip**, then **Download** and save to C:\Downloads.



WimpVSOP Menu Update Select

### WHAT IS ON THE DISPLAY PANELS

The following is a simple breakdown and description of the operation of each program. In the descriptions below the term "Real Time" defines the state of operation of "Mars," "Jupiter," and "Saturn" after starting. These programs start up and keep time with the computer clock. So, the Ephemerides are displayed each *minute* of operation:

Each routine contains a panel at the top displaying the *Civil Date and Time*, *Universal Date and Time*, *Julian Date*, *Sidereal Time*, *Sun Rise*, *Mars Rise*, *Observers Latitude and Longitude*.

NOTE: Universal date and time can be entered by clicking the appropriate window and following the prompts in the input boxes. An example is the Dist (AU) window when clicked will display the distance in miles, kilometers and the light time from the planet. NOTE: see **Appendix III -- GENERAL NOTES** for definitions for the panel labels and data panels.

Mars VSOP (Ver. 8.6, 15 November 2020) — □ ×

Options Phem Help

CivilDate	UnivDate	JulianDate	MarsDate	MarsRise	SunRise
13-Nov-20	13-Nov-20	2459167.068	Feb 03	20:35	11:44
CivilTime	UnivTime	SiderealTime	Obs.Latitude	Obs.Longitude	
8:38 AM	13:38:08	11:45:21	27°N21'06.5"	081°W19'34.7"	

R.A.	00:57:34	Ls*	313.9
Dec*	5.1	De*	-23.7
Altitude*	-53	Ds*	-17.9
Azimuth*	329	CM*	103.4
Elong*	143.6E	Phase(k)	0.957
Vis. Mag	-1.7	Phase(i)*	23.9
AU	0.5277073	PA Def*	66.0
AppDia	17.7"	PA Axis*	326.7

South

North

<---Rotation--->

Inverted

International Mars Patrol Astronomical Calculator (WIMP). Compiled using Microsoft Visual Basic Pro 5.0. By: J.D. Beish, Lake Placid, Florida 33852

The WimpVSOP window for the Mars routine.

When the cursor hovers over a panel label the cursor may change to a "question mark (?)" and when clicked a pop-up window will appear with an explanation of the terms, brief help and in some cases mathematical equations. When the cursor hovers over one of the "3-D" data windows

and the cursor will change to an arrow  so it also can be clicked and a pop-up panel will appear. To set a new date click in the "UnivDate" window and a panel will appear (see figure below) then a new date can be entered. The WimpVSOP will indicate the parameters for the new date and 0000h UT.



**The New Iniv. Date entry listboxes**

In the center is a graphic globe displayed with latitude and longitude grid lines to represent the particular planet and simulate its appearance in a telescope eyepiece. Panels at the top and bottom indicating the view of the planet with Celestial North or South, the direction of drift of the planet [(P)receding Drift or (F)ollowing] in the eyepiece field, the axial rotation of the planet and a select planet at the bottom to invert the field.

### DISCUSSION

In the past few years the WIMP programs have been revised to include the Transit Time of passage and opposition dates for the planets. For Mars, the Closest Approach date is also included. Planetary Phenomena; such as dates for seasons, perihelion and aphelion, etc., and Positions for the satellites of Jupiter were also added.

If readers have any specific questions place do not hesitate to ask me either on my private e-mail to: [jeff.beish@gmail.com](mailto:jeff.beish@gmail.com). Please remember that I come from an engineering background and just happened to be an amateur astronomer, so methods may not be as clear as mud. Detailed descriptions and discussions are covered on The [Mars Observers Café](#).

### **Appendix I -- FURTHER READING**

Duffet-Smith, Peter, Practical Astronomy with your Calculator , Cambridge Press, L.C. 81-6191 (ISBN 0 521 24059, 2nd Edition, 1981.

Duffet-Smith, Peter, Astronomy with your Personal Computer , Cambridge Press, L.C. 85-6704 (ISBN 0 521 26620, 1st Edition, 1985 and 2nd edition, L.C. 89-17444 (ISBN) 0 521 38093 6.

Meeus, Jean, Astronomical Formulas for Calculators , Willmann-Bell, L.C. 82-8495 (ISBN 0 943396-01-8, 1st edition, 1980.

Meeus, Jean, Astronomical Algorithms , Willmann-Bell, L.C. 91-23501 (ISBN 0 943396-35-2, 1st edition, 1991.

Smart, W.M., Textbook on Spherical Astronomy , Cambridge Press, L.C.  
76-150643 (ISBN 0 521 09159 4)6th Edition, 1980.

## Appendix II – API functions

For detailed discussions on the **API functions** go to [Gary Beene's VB6 Information Center](#). Also, informative discussions on the various elevated operating levels and to understand how to control your User Account Control (UAC) and various security procedures in Windows, one may go to: the Windows [Seven](#), Windows [Eight](#), Windows [Ten](#) or Windows [Eleven](#) Forums in the respective Tutorials sections to detail the necessary setups and to run the WIMP programs. Another change, starting with Windows 8, was renaming *Windows Explorer* to *File Explorer*. **NOTE:** Recent 2017 Windows updates have changed the “[take ownership](#)” feature while using either *Windows Explorer* or *File Explorer* to view files, folders, etc., on your Hard Drive. So, some of the Wimp features will result in runtime errors; the Windows [Seven](#), Windows [Eight](#), Windows [Ten](#) or Windows [Eleven](#) Forums in the respective Tutorials section to add this feature to the “context menu.” I suggest that you change the folder permissions for 32-bit and 64-bit Windows 7, 8, 10 and 11: C:\Wimp using the following procedures.

## Appendix III -- GENERAL NOTES:

The **Latitude** and **Longitude** entry format is as follows: Latitude: **dd:mm:ss.s** and Longitude: **ddd:mm:ss.s**. If this is not followed then an error will occur.

**Julian Day** is reckoned in days from 1 January 4713 B.C. and clicking on this window reveals the MJD and MJD from January 1 to the current year MJD from January 01, current year and from January 01, 1900. Also, the Ls for the Earth orbit.

**MarsDate** is the fictitious dating system that conforms to Earth dates.

**MarsRise** indicates the rise time, transit time with elevation in degrees and set time.

The Positional Ephemeris is within a panel on the left of the window that displays the Right Ascension (R.A.), declination (Dec), altitude, azimuth, planetary elongation (Elong), visual magnitude (Vis. Mag), distance planet is from **Earth (AU)** and the apparent diameter (**AppDia**).

The Physical Ephemeris on the right panel displays the Longitude of the Sun (Ls), declination of the **Earth (De)**, and **Declination of the Sun (Ds)**, the **Central Meridian (CM)**, **Phased (k)**, **Phase (i)**, **Positional Angle of the Defect (PA Def)** and **Positional Angle of the Axis (PA Axis)**.

**RA the Right Ascension** -The Geocentric Right Ascension of the center of Mars in hours (hr), minutes (mn), and seconds (sc).

**Dec the Declination** --The Declination of the center of Mars in degrees (dg), minutes (mn), and seconds (s).

**Azimuth the angle of Mars with respect to the observer's view of the North Point of Earth.**

When the observer is facing south then north is behind him or her at 0 degrees. On the observer's left is east or azimuth from 1 to 179 degrees and on the right from 180 to 359 degrees.

**Altitude** the height of the planet from the horizon, in degrees, atmospheric extension and refraction in arc minutes.

**Vis. Mag** is the visual magnitude of Mars or brightness.

**Dist (AU)** the distance of Earth from the planet in Astronomical Units. (An Astronomical Unit is 149,597,892 km).

**AppDia.** is the diameter of the apparent disk of the planet in seconds of arc.

**Wk Day** day of the week.

**Dnum** Day of the year number.

**Ls** is measured eastward in the planet's orbital plane from its Northern Hemisphere vernal equinox. (Also referred to Planetocentric Longitude). 0° Ls is defined as that point where the Sun crosses the Martian celestial equator from south to north, that is the planet's northern hemisphere vernal equinox. The other Ls values that define the beginnings of Martian northern hemisphere seasons are: summer, 90° Ls; autumn, 180° Ls; and winter, 270° Ls.

**De** is the Sub-Earth point as seen from Earth with respect to the planet in degrees (Equivalent to "Earth Latitude").

**Ds** is the Sub-Solar point would be seen from the Sun with respect to the planet in degrees (positive to the north)

**CM** or the Central Meridian is an imaginary line passing through the planetary poles of rotation and bisecting the planetary disk. This line is used to define what planetographic longitudes are present on the disk during an observing session. Also, by clicking this window the user can enter a future central meridian to be computed and the time of the next appearance of entered CM will display.

**CM I, CMII, and CMIII** - the Central Meridians for Jupiter and Saturn is an imaginary line passing through the planetary poles of rotation and bisecting the planetary disk. Also, in the Venus routine when the CM window is clicked displays System-II.

**Phase (k).** The terminator phase (the line where daylight ends and night begins), or defect of illumination, is given in seconds of subtended arc on the apparent disk, or in degrees (i) or the ratio (k), to define how much of the geometrical planetary disk is in darkness. Equation:  $k = (1 + \cos i) / 2$ , where i the angle of the terminator in degrees.

**PA Defect is the POSITION ANGLE DEFECT**--Sun-Mars-Earth position angle of greatest defect of illumination. Amount of observed planetary disk not illuminated by the Sun.

**PA Axis is the POSITION ANGLE AXIS**--Position angle of the North Pole of Mars with respect to the North Pole of the Earth.

**NOTE:** The planet is shown with south at the top as would be seen in a simply inverted telescope. To show a non-inverted image the user can click on the small window panel at the lower left corner that states how the IMAGE appears at that time (INVERTED or NON-INVERTED).

**NOTE:** The menu item Satellites for JUPITER show a screen and displays the position of the four moons of Jupiter. Low resolution and used to for a quick check only.

#### **Appendix IV - Compute Jupiter's GRS Longitude Drift**

The new equations for the best estimates to compute Jupiter's GRS Longitude Drift during each Universal Year and resulting in the following Julian Date break points and equations:

UDate	JD	Equation
01/01/2020	2458849.5	$y = 0.070355056280992 * JD - 172668.65938166$
01/01/2021	2459215.5	$y = 0.042892821782024 * JD - 105131.29216888$
01/01/2022	2459580.5	$y = 0.064596730925447 * JD - 158873.44010222$
01/01/2023	2459945.5	$y = 0.052583294919077 * JD - 129323.06149731$
01/01/2024	2460310.5	$y = 0.057178355606021 * JD - 140627.82651889$
01/01/2025	2460676.5	$y = 0.0570078061825 * JD - 140208.060792$

Since what we see is only Jupiter's clouds and gases such as clouds are difficult at best to compute positions it is a miracle that we can even begin to compute their positions!